S P E C I F I C A T I O N S

BRUNSWICK COUNTY COURTHOUSE ADDITION & RENOVATIONS

Bolivia, NC 28422

SEPTEMBER 23, 2019

Sawyer Sherwood & Associate, P.C.
124 Market Street
Wilmington, NC 28401

BRUNSWICK COUNTY

Brunswick County Courthouse Addition and Renovations
INVITATION TO BID

General Contract Bidders on this project shall have completed the Pre-Qualification process for this project previously advertised. Sealed proposals will be received from prequalified general contractors until 3:00 p.m. on Thursday, January 16, 2020 in the Code Administration Conference room, Building "I" , Brunswick County Government Center for the furnishing of labor, material, and equipment entering into the construction of the Brunswick County Courthouse Addition & Renovations and shortly thereafter the bids will be opened publicly and read aloud. A general description of the work includes:

Construction of a three story, 15,000 SF addition as well as renovations of the existing 102,450 SF courthouse. The addition construction includes auger cast pile foundations, concrete floors on structural steel frame, composite deck, open web joist roof framing on structural steel. Exterior shear walls are reinforced masonry with other exterior walls and all interior framing being light gauge steel stud framing. Existing building renovations will replace several precast concrete exterior wall panels with cast in place concrete shear walls having openings to access the addition. Interior renovations will enlarge courtrooms and accommodate offices supporting the courts.

Pre-Bid Meeting: A pre-bid meeting will be held for all interested bidders and vendors on January 6, 2020 , 2pm in the Code Administration Conference room, Building "I" , Brunswick County Government Center.

Site Visitation: Individual inspection of the proposed construction site and existing building may be allowed only by approval of Brunswick County. Telephone the contact person noted below in order to schedule a visit.

Brunswick County Engineering Dept.
Attention: Wm. L. Pinnix, P.E.
(910) 253-2500

Paper Copies of the Contract Documents will be issued by the project architect following receipt of a refundable bid set deposit in the amount of $350.00. returned bid sets must be complete and in good condition.
Partial sets of the Contract Documents will not be issued.

The Contract Documents may be examined at the following locations:

- Carolinas A.G.C. Digital Plan Room online www.cagc.org on IBuild®
- CDC News Office online www.cdcnews.com
- McGraw Hill Construction Dodge Digital Plan Room online www.dodge.construction.com
- Brunswick County Engineering, 75 Courthouse Drive, Building I, Bolivia , NC
- Sawyer Sherwood & Associate Architects, 124 Market Street , Wilmington, NC

Brunswick County reserves the unqualified right to reject any and all proposals. A 5% bid bond or deposit is required. Brunswick County has implemented a Minority Business Enterprise Policy that requires Contractors to exhibit a good-faith effort to contact minority business subcontractors whose work on the project would represent 10% of the total value of the work. Contractors must be properly licensed. Additional instructions to bidders are included in the Contract Documents.

NOTICE TO BIDDERS

General Contract Bidders on this project have completed the Pre-Qualification process previously advertised. Sealed proposals will be received from prequalified general contractors until 3:00 p.m. on Thursday, January 16, 2020 in the Code Administration Conference room, Building "I" , Brunswick County Government Center for the furnishing of labor, material, and equipment entering into the construction of: Brunswick County Courthouse Addition & Renovations and shortly thereafter the bids will be opened publicly and read aloud.

Sealed bids shall be labeled with the project name, Contractor's name, address, and license number and must be marked "SEALED BID, DO NOT OPEN." Bids shall be sent to:

Alternate Shipping Service or Hand Delivery

Brunswick County Engineering Dept.
Attention: William L. Pinnix, P.E
75 Courthouse Drive
Building I
Bolivia, NC 28422
(910) 253-2500

US Post Office

Brunswick County Engineering Dept.
Attention: William. L. Pinnix, P.E.
P. O. Box 249
Bolivia, NC 28422

Project Description: Construction of a three story, 15,000 SF addition as well as renovations of the existing 102,450 SF courthouse. The addition construction includes auger cast pile foundations, concrete floors on structural steel frame, composite deck, open web joist roof framing on structural steel. Exterior shear walls are reinforced masonry with other exterior walls and all interior framing being light gauge steel stud framing. Existing building renovations will replace several precast concrete exterior wall panels with cast in place concrete shear walls having openings to access the addition. Interior renovations will enlarge courtrooms and accommodate offices supporting the courts.

The foregoing description shall not be construed as a complete description of all work required.

Bids will be received for a Single Prime construction contract to include all trades. All proposals shall be lump sum with provisions for unit prices as indicated in the Form of Proposal. The project shall be completed within seven hundred thirty (730) consecutive calendar days. There are liquidated damages associated with this project. Liquidated damages will be in the amount of $500.00 per day for each calendar day beyond the completion date set from the Notice to Proceed.

Site Visitation: Inspection of the proposed construction site and existing building may be allowed outside of the pre-bid meeting by approval of Brunswick County. Telephone the above noted contact person in order to schedule a visit.

Pre-Bid Meeting: A pre-bid meeting will be held for all interested bidders and vendors on January 6, 2020 , 2pm in the Code Administration Conference room, Building "I" , Brunswick County Government Center.

The pre-bid meeting will address project specific questions, issues, and bidding procedures. Additional information and Addenda will be made available to the bidder by email during the bid period timely questions from bidders will allow the last addenda to be sent five (5) days prior to bid the date. The Contractor is responsible for ensuring that their contact information email is correct and on file with the person designated below. All questions or requests for clarifications must be submitted no later than seven (7) days prior to the bid date by email. These shall be directed to:

John R. Sawyer, AIA
Sawyer Sherwood & Associate Architects
124 Market Street
Wilmington, NC 28401
Email John@s2a3.com
(910) 762 0892

Paper Copies of the Contract Documents will be issued by the architect following receipt of a refundable bid set deposit in the amount of $350.00. returned bid sets must be complete and in good condition.
Partial sets of the Contract Documents will not be issued. The Contract Documents may be examined at the following locations:

- Carolinas A.G.C. Digital Plan Room online www.cagc.org on IBuild®
- CDC News Office online www.cdcnews.com
- McGraw Hill Construction Dodge Digital Plan Room online www.dodge.construction.com
- Brunswick County Engineering, 75 Courthouse Drive, Building I, Bolivia , NC
- Sawyer Sherwood & Associate Architects, 124 Market Street , Wilmington, NC

Insurance Requirements: The Contractor is required to have insurance as outlined in the General Conditions

Licensing: All Contractors are hereby notified that they must have proper license as required under the state laws governing their respective trades. General Contractors are notified that Chapter 87, General Statutes of North Carolina, will be observed in receiving and awarding general contracts. General Contractors submitting bids on this project must have an unlimited license classification

NOTE: Under NCGS 87-1, a Contractor that superintends or manages construction of any building, highway, public utility, grading, structure, or improvement shall be deemed a "General Contractor" and shall be so licensed. Therefore a single prime project that involves other trades will require the Single Prime Contractor to hold a proper General Contractor's license.

NOTE: The bidder shall identify on its bid proposal the minority business participation it will use on the project form *(Identification of Minority Business Participation*) and shall include either *Affidavit **A*** or *Affidavit **B*** as applicable. Forms and instructions are included within the Proposal Form in the bid documents. Failure to complete these forms is grounds for rejection of the bid. (NCGS143-128.2c Effective 1/1/2002.) General contractors are notified that Chapter 143, General Statutes of North Carolina, and the "Brunswick County Minority Business Enterprise Policy" (MBE) will be observed in receiving and awarding general

contracts. Brunswick County requires contractors that are not self-performing 100% of the total value of the work to verify that they have contacted MBE subcontractors whose work on the project would represent at least ten percent (10%) of the total value of work.

Each proposal shall be accompanied by a cash deposit or a certified check drawn on some bank or trust company, insured by the Federal Deposit Insurance Corporation, of an amount equal to not less than five percent (5%) of the proposal, or in lieu thereof a bidder may offer a bid bond of five percent (5%) of the bid executed by a surety company licensed under the laws of North Carolina to execute the contract in accordance with the bid bond. Said deposit shall be retained by the owner as liquidated damages in event of failure of the successful bidder to execute the contract within ten (10) days after the award or to give satisfactory surety as required by law.

A performance bond and a payment bond will be required for one hundred percent (100%) of the contract price. An additional bond with the North Carolina Department of Transportation may be required for work performed in the right-of-way. Surety companies must be authorized to do business in North Carolina.

Contractor agrees that the Contractor and the Contractor's subcontractors shall comply with the requirements of Article 2 of Chapter 64 of the North Carolina General Statutes. E-Verify is a program in which the employment eligibility of all newly hired employees will be confirmed after the Employment Eligibility Verification Form (Form I-9) has been completed.

Payment will be made based on ninety-five percent (95%) of monthly estimates and final payment made upon completion and acceptance of work.

The owner reserves the right to reject any or all bids and to waive informalities.

Designer:

Sawyer Sherwood and Associate, PC
John R. Sawyer, john@s2a3.com
PO Box 176
Wilmington, N.C. 28402
(910) 762 0892

Owner:

Brunswick County
Attention: William.L. Pinnix, P.E.
P. O. Box 249
Bolivia, NC 28422

BRUNSWICK COUNTY, NORTH CAROLINA

Brunswick County Courthouse Addition & Renovations

INSTRUCTIONS TO BIDDERS
Version Date – January 2019

For a proposal to be considered it must be in accordance with the following instructions:

1. **PROPOSALS**

Proposals must be made in accordance with the Form of Proposal provided, and all blank spaces for bids, alternates, and unit prices applicable to Bidder's Work shall be properly filled in. When requested alternates are not bid, the proposal may be considered incomplete. The Bidder agrees that a bid on the Form of Proposal detached from specifications will be considered and will have the same force and effect as if attached thereto. Faxed proposals will not be considered. Numbers shall be stated both in writing and in figures for the base bids and alternates.

The proposal shall include the following:

a. Form of Proposal

b. Identification of Minority Business Participation form

c. MBE Affidavit A (Listing of Good Faith Efforts) **or** Affidavit B (Intent to Perform Contract with Own Workforce)

d. Form of Bid Bond **or** cash deposit.

Any modifications to the Form of Proposal (including alternates and/or unit prices) may disqualify the bid and may cause the bid to be rejected.

The Bidder shall fill in the Form of Proposal as follows:

a. If the documents are executed by a sole Owner, that fact shall be evidenced by the word "Owner" appearing after the name of the person executing them.

b. If the documents are executed by a partnership, that fact shall be evidenced by the word "Co-Partner" appearing after the name of the partner executing them.

c. If the documents are executed on the part of a corporation, they shall be executed by either the president or the vice president and attested by the secretary or assistant secretary in either case, and the title of the office of such persons shall appear after

their signatures. The seal of the corporation shall be impressed on each signature page of the documents.

d. If the proposal is made by a joint venture, it shall be executed by each member of the joint venture in the above form for sole Owner, partnership or corporation, whichever form is applicable.

e. All signatures shall be properly witnessed.

f. If the Contractor's license of a Bidder is held by a person other than an Owner, partner or officer of a firm, then the licensee shall also sign and be a party to the proposal. The title "Licensee" shall appear under his/her signature.

Proposals shall be addressed as indicated in the Notice to Bidders and shall be delivered, enclosed in an opaque sealed envelope, marked "SEALED BID, DO NOT OPEN" and bearing the project name, name of the Bidder, address of the Bidder, and the Contractor's license number. Bidders shall clearly mark on the outside of the bid envelope which Contract(s) they are bidding.

Bidder shall identify on the bid the minority businesses that will be utilized on the project with corresponding total dollar value of the bid and affidavit listing good faith efforts or an affidavit indicating Work under Contract will be self-performed, as required by NCGS 143-128.2(c) and NCGS 143-128.2(f). Failure to comply with these requirements is grounds for rejection of the bid. Upon notification of being the apparent low bidder, the apparent low Bidder and any other Bidder so requested, will within seventy-two hours of the notification submit an affidavit that includes a description of the portion of Work to be executed by minority businesses, which is equal to or more than the applicable goal (Affidavit C), or submit an affidavit documenting the Contractor's good faith efforts to meet the goal (Affidavit D).

For projects bid in the single-prime alternative, the names and license numbers of major Subcontractors shall be listed on the proposal form.

It shall be the specific responsibility of the Bidder to deliver his bid to the proper official at the selected place and prior to the announced time for the opening of bids. Later delivery of a bid for any reason, including delivery by the United States Postal Service or other delivery service, shall disqualify the bid.

Modifications of previously deposited bids will be acceptable only if delivered in writing or by telegram or fax to the place of the bid opening prior to the time for opening bids. Telegraphic and fax modifications must be confirmed in writing within 72 hours after the opening of bids.

Unit prices quoted in the proposal shall include overhead and profit and shall be the full compensation for the Contractor's cost involved in the Work. See General Conditions, "Changes in the Work" Paragraph (C 1).

2. EXAMINATION OF CONDITIONS AND CONTRACT DOCUMENTS

It is understood and mutually agreed that by submitting a bid the Bidder acknowledges that he has carefully examined all documents pertaining to the Work; the location, accessibility, and general character of the site of the Work and all existing buildings, structures, and utility facilities within and adjacent to the site; and has satisfied himself as to the nature of the Work; sequences or procedures of construction (if any); the condition

of existing buildings and structures; the conformation of the ground; the character, quality, and quantity of the material to be encountered; the subsurface conditions (including type and depth of rock and soil layers); the character of the equipment, machinery, plant and any other facilities needed preliminary to and during prosecution of the Work; the general and local conditions; federal, state, and local laws and regulations; the construction hazards; and all other matters, including, but not limited to, the labor situation which can in any way affect the Work under the Contract; and including all safety measures required by the Occupational Safety and Health Act of 1970 and all rules and regulations issued pursuant thereto. It is further mutually agreed that by submitting a proposal the Bidder acknowledges that he has satisfied himself as to the feasibility and meaning of the plans, drawings, specifications, and other Contract Documents for the construction of the Work and that he accepts all the terms, conditions, and stipulations contained therein; and that he is prepared to Work in cooperation with other Contractors performing Work on the site. Neither the Owner nor Designer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Contract Documents.

Reference is made to Contract Documents for the identification of those surveys and investigation reports of subsurface or latent physical conditions at the site or otherwise affecting performance of the Work which have been relied upon by the Designer in preparing the documents. In no event shall these surveys and investigation reports be considered part of the Contract Documents. The Owner will make copies of all such surveys and reports available to the Bidder upon request. Neither the Owner nor the Designer assumes any responsibility for the accuracy or completeness of the information provided.

Each Bidder may, at his own expense, make such additional surveys and investigations as he may deem necessary to determine his bid price for the performance of the Work. Any on-site investigation shall be done at the convenience of the Owner. Reasonable requests for access to the site will be honored by the Owner. It is the responsibility of the Bidder to clean up and restore the site to its former condition upon completion of such explorations, investigations, tests, and studies. Such Work shall be done in a manner that in no way hinders or complicates normal operation and maintenance of existing facilities.

The Contractor performing excavation Work shall be responsible for locating underground utilities prior to excavation. The utility locations shown in the Plans are approximate and for information only. The Contractor may obtain the services of a commercial utilities locator and/or call the various utility companies who may have lines in the area.

3. AVAILABILITY OF LANDS FOR WORK

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

4. PRE-BID CONFERENCE

Prior to the date set for receiving bids, the Designer may arrange and conduct a Pre-Bid Conference for all prospective Bidders. The purpose of this conference is to review project

requirements and to respond to questions from prospective Bidders and their Subcontractors or material suppliers related to the intent of bid documents. Attendance by prospective Bidders shall be as required by the "Notice to Bidders." Brunswick County strongly encourages attendance at the pre-bid meeting. It should be noted that attendance may help to fulfill necessary MBE requirements.

5. SUBSTITUTIONS

In accordance with the provisions of NCGS 133-3, material, product, or equipment substitutions proposed by the Bidders to those specified herein can only be considered during the bidding phase until ten (10) days prior to the receipt of bids when submitted to the Designer with sufficient data to confirm material, product, or equipment equality. Proposed substitutions submitted after this time will be considered only as potential change orders.

Submittals for proposed substitutions shall include the following information:

a. Name, address, and telephone number of manufacturer and supplier as appropriate.

b. Trade name, model, or catalog designation.

c. Product data including performance and test data, drawings with dimensions, specifications, catalog cut-sheets, electrical requirements and schematic diagrams, materials of construction of all components, reference standards, and technical descriptions of material, product, or equipment. Include color samples and samples of available finishes as appropriate.

d. Detailed comparison with specified products including performance capabilities, warranties, maintenance schedule, and test results. Any deviations to the specified product requirements shall be noted.

e. Other pertinent data including data requested by the Designer to confirm product equality. This may include examples of the substitutes in use on other projects along with performance records. The Contractor shall demonstrate that the Substitution will function equally or better than the specified product, taking into account the Owner's need of standardization and compatibility with other infrastructure components.

f. Listing of spare parts to be included with Substitution.

g. A comparison of the impact on the Contractor's schedule between using the proposed Substitution item and the specified product.

If a proposed material, product, or equipment substitution is deemed adequate by the Designer, all Bidders of record will be notified by Addendum.

6. BULLETINS AND ADDENDA

Any addenda to drawings and specifications issued prior to the bid opening shall be considered covered in the Proposal and in closing a Contract they will become a part thereof. Addenda may include, but are not limited to, answers to questions, clarifications, and amendments of the Contract Documents. It shall be the Bidder's responsibility to ascertain prior to bid time the addenda issued and to see that his bid includes any changes thereby required.

Should the Bidder find discrepancies, errors, conflicts, ambiguities, or omissions from the drawings or documents; conflicts between Bidder's observations and the Contract Documents; or should he be in doubt as to the meaning of the Contract Documents; he shall at once notify the Designer or Owner who will provide written instructions in the form of addenda. The Bidder shall submit all questions or requests for clarifications in writing (email or fax is acceptable) no later than ten (7) days prior to the bid date. The Notice to Bidders indicates the contact person for submittal of questions. Notification of addenda shall be issued by the Owner approximately seven (5) days prior to the date set for receipt of bids. Neither the Owner nor the Designer will be responsible for any oral instructions.

In the event that discrepancies, errors, conflicts, ambiguities, or omissions are discovered by the Bidder and have not been resolved by the Designer or Owner prior to submitting the bid, the Bidder shall include in the bid the greater quantity or better quality of Work, or compliance with the more stringent requirement resulting in greater cost. Such greater cost shall be included in the bid.

All addenda shall be acknowledged by the Bidder(s) on the Form of Proposal.

7. BID SECURITY

Each proposal shall be accompanied by a cash deposit or a certified check drawn on some bank or trust company insured by the Federal Deposit Insurance Corporation, or a bid bond in an amount equal to not less than five percent (5%) of the Bidder's maximum bid price, said deposit to be retained by the Owner as liquidated damages in event of failure of the successful Bidder to execute the Contract within ten (10) days after the award or to give satisfactory surety as required by law (NCGS 143-129).

Bid bond shall be conditioned that the surety will, upon demand, forthwith make payment to the obligee upon said bond if the Bidder fails to execute the Contract. The Owner may retain bid securities of any Bidder(s) who may have a reasonable chance of award of Contract until the 101st day after the bid opening. Other bid securities may be released sooner, at the discretion of the Owner. All bid securities (cash or certified checks) shall be returned to the Bidders within ten (10) days after award of Contract. Standard Form of Bid Bond is included in these specifications.

8. RECEIPT OF BIDS

Bids shall be received in accordance with requirements of the General Statutes of North Carolina and Brunswick County policy. Bid security shall be required as prescribed by statute. Prior to the deadline for receipt of bids, the Bidder will be permitted to change or withdraw his bid.

9. OPENING OF BIDS

Upon opening, all bids shall be read aloud. Once any bid is opened, there shall not be any withdrawal of bids by any Bidder and no bids may be returned by the Designer to any Bidder. After the bid opening, a Bidder may request that his bid be withdrawn from consideration without forfeiture of his bid security in accordance with the provisions of the NCGS 143-129.1. In accordance with NCGS 143-129.1, a request for withdrawal of a bid must be made in writing to the Owner within seventy-two (72) hours after the bid opening (excluding Saturdays, Sundays, Brunswick County holidays, and other days in which the Brunswick County government offices are closed). Except under the provisions of NCGS 143-129.1, all bids shall remain valid a minimum of ninety (90) days from the opening of bids. Approval of the proposal by the Brunswick County Board of Commissioner's at a public meeting or a signed "Notice of Award"

shall constitute acceptance of the bidder's proposal. Should the successful Bidder default and fail to execute a Contract, the Contract may be awarded to the next lowest and responsible Bidder. The Owner
the unqualified right to reject any and all bids. Reasons for rejection may include, but shall not be limited to, the following:

a. If the Form of Proposal furnished to the Bidder is not used or is altered.

b. If the Bidder fails to insert a price for all bid items, alternate and unit prices requested.

c. If the Bidder adds any provisions reserving the right to accept or reject any award.

d. If there are unauthorized additions or conditional bids, or irregularities of any kind which tend to make the proposal incomplete, indefinite, or ambiguous as to its meaning.

e. If the Bidder fails to complete the proposal form where information is requested so the bid may be properly evaluated by the Owner.

f. If the unit prices contained in the bid schedule are unacceptable to the Owner.

g. If the Bidder fails to comply with other instructions stated herein.

h. If the Owner suspects the Bidders of collusion.

i. If the Bidder does not submit all the required proposal forms.

j. If the Bidder does not execute the complete Contract (with performance and payment bonds) within ten (10) days of receipt of the Notification of Award.

10. **BID EVALUATION**

The award of the Contract will be made to the lowest responsible Bidder as soon as practical. The Owner may award on the basis of the base bid, unit prices, any alternates the Owner chooses. Discrepancies on the Bidder's proposal shall be resolved based on the Owner's inspection and interpretation of the proposal as a whole. In cases where it is not evident what portion of a proposal is errant, discrepancies shall be resolved as follows:

- Words shall take precedence over numerical symbols.
- The correct sum of any column of figures shall take precedence over the indicated sum.

In determining the lowest responsible, responsive Bidder, the Owner shall take into consideration the Bidder's compliance with the requirements of NCGS 143-128.2(c) and County policy.

If the Owner determines that the apparent low Bidder is not the lowest responsible, responsive Bidder by virtue of the above information, said apparent low Bidder will be so notified and his bid security shall be returned to him.

11. CONTRACT, PERFORMANCE BOND, PAYMENT BOND, INSURANCE, E-VERIFY

The successful Bidder, within ten (10) days of receipt of the "Notice of Award," shall sign and deliver the required number of Contract counterparts, a performance bond in an amount equal to one hundred percent (100%) of the Contract Price, a payment bond in an amount equal to one hundred percent (100%) of the Contract Price, and all necessary certificates of insurance. Contractor shall comply with the requirements of Article 2 of Chapter 64 of the General Statutes. Further, if Contractor utilizes a subcontractor, Contractor shall require the subcontractor to comply with the requirements of Article 2 of Chapter 64 of the General Statutes. An additional performance guarantee with the North Carolina Department of Transportation may be required for work performed in the right-of-way. In this event, the successful Bidder, within ten (10) days of receipt of the "Notice of Award," shall supply the Owner with a copy of the executed performance guarantee and evidence of acceptance by the NCDOT. See the Supplementary General Conditions and General Conditions sections "Terminology and Intent of Documents," "Execution of Documents," "Performance Bond and Payment Bond," and "Minimum Insurance Requirements".

12. PAYMENTS

Payments to the successful Bidders (Contractors) will be made on the basis of monthly estimates. See "Requests for Payment," General Conditions.

13. MINORITY BUSINESS PARTICIPATION

Bidders are notified that NCGS 143-128.2 and the "Brunswick County Minority Enterprise Policy" shall be observed in receiving and awarding Contracts. As noted in this document under the heading "PROPOSALS," appropriate forms and affidavits must be submitted with the bids. The state document entitled "Guidelines for Recruitment and Selection of Minority Businesses for Participation in State Construction Contracts" may be used for reference. It may be obtained from the State Construction Office website (http://www.nc-sco.com). A listing of Historically Underutilized Businesses may be obtained through the North Carolina Department of Administration Office for Historically Underutilized Businesses at http://www.doa.state.nc.us/HUB/. Brunswick County promotes the notification and use of Brunswick County based businesses. The "Brunswick County Minority Enterprise Policy" follows:

BRUNSWICK COUNTY MINORITY ENTERPRISE POLICY

RESOLUTION APPROVING AND ADOPTING A VERIFIABLE FIVE PERCENT (5%) GOAL FOR PARTICIPATION BY MINORITY BUSINESSES IN THE TOTAL VALUE OF WORK FOR EACH PROJECT IN BRUNSWICK COUNTY EXCEEDING ONE HUNDRED THOUSAND DOLLARS ($100,000.00) FOR WHICH A CONTRACT OR CONTRACTS ARE AWARDED AFTER RECEIVING BIDS FOR SAID PROJECT BY EITHER A MULTI-PRIME OR A SINGLE-PRIME APPROACH

The Brunswick County Board of Commissioners in regular session duly assembled on December 18, 1989, does hereby resolve as follows:

THAT WHEREAS, North Carolina General Statute 143-128(c), effective June 28, 1989 requires the public body of each county in the State of North Carolina to adopt an appropriate verifiable percentage goal for participation by minority businesses in the total value of work for which a contract or contracts exceeding One Hundred Thousand Dollars ($100,000.00) are awarded on either a multi-prime or single-prime basis; and

WHEREAS, the term "minority business" is defined by Statute to mean a business;

a. In which at least fifty-one percent (51%) is owned by one or more minority persons, or in the case of a corporation in which at least fifty-one percent (51%) of the stock is owned by one of more minority persons; and

b. Of which the management and daily business operations are controlled by one or more of the minority persons who own it; and

WHEREAS, the term "minority person" is defined by Statute to mean a person who is a citizen or lawful permanent resident of the United States and who is:

a. Black, that is, a person having origins in any of the black racial groups in Africa; or

b. Hispanic, that is, a person of Spanish or Portuguese culture with origins in Mexico, South or Central America, or the Caribbean Islands, regardless of race; or

c. Asian American, that is, a person having origins in any of the original peoples of the Far East, Southeast Asia and Asia, the Indian subcontinent, the Pacific Islands; or

d. American Indian or Alaskan Native, that is, a person having origins in any of the original peoples of North America; or

e. Female; and

WHEREAS, the term "verifiable goal" is defined by Statute to mean for purposes of the separate prime contract system, that the awarding authority has adopted written guidelines specifying the actions that will be taken to ensure a good faith effort in the recruitment and selection of minority businesses for participation in contracts awarded under N.C.G.S. 143-128; and

WHEREAS, the term "verifiable goal" is defined by Statute to mean for purposes of the single-prime contract system, that the awarding authority has adopted written guidelines specifying the actions that the prime contractor must take to ensure a good faith effort in the contracts awarded under N.C.G.S. 143-128; and

WHEREAS, the Brunswick County Board of Commissioners, pursuant to public notice duly given, has held a public hearing on establishing an appropriate verifiable percentage goal for participation by minority businesses in public construction contracts awarded by the County by either multi-prime or single-prime contracts, and the Board of Commissioners has considered the comments of persons who requested to be heard; and

WHEREAS, the Board of Commissioners desires to adopt a verifiable percentage goal as heretofore defined for Brunswick County.

NOW, THEREFORE, BE IT RESOLVED, AS FOLLOWS:

1. That the appropriate verifiable percentage goal for participation by minority businesses in the total value of work for each project in Brunswick County which is awarded pursuant to and in compliance with N.C.G.S. 143-128 shall be five percent (5%).
2. That for the purposes of the separate prime (or multi-prime) contract system, the County shall be responsible for ensuring a good faith effort in the recruitment and selection of minority businesses for participation in contracts awarded.
3. That in order to demonstrate this good faith effort, the County shall take the following actions in awarding contracts pursuant to a separate prime system:
    a. Advertise the project for bids both locally, regionally and state-wide, stating in each advertisement for bids that the County is seeking minority business participation of at least five percent (5%);
    b. Cause this Resolution to be forwarded to the North Carolina Association of County Commissioners and supervising and/or administrative agencies of the State of North Carolina to apprise those agencies of Brunswick County's goal and to seek their assistance in the recruitment of minority businesses; and
    c. Award all public contracts as required by N.C.G.S. 143-128 without regard to race, religion, color, creed, national origin, sex, age or handicapped condition, as defined by N.C.G.S. 168A-3.
4. That for the purposes of the single-prime contract system, it shall be the responsibility of the prime contractor to ensure to the County by written documentation that it has made a good faith effort in the recruitment and selection of minority businesses for participation in contracts awarded.

5. That in order to demonstrate the good faith effort of the single-prime contractor, the contractor shall by written documentation notify the County on its bid that it has taken the following steps:
   a. Actively sought the participation of minority businesses by contracting known minority businesses who may be interested in participation in a Brunswick County project.
   b. Verify that it has contacted minority-business subcontractors whose work on the project would represent ten percent (10%) of the total value of work, in order to achieve the five percent (5%) goal.
   c. Verify to the County the names and addresses of the minority-businesses contacted and their respective bids on the sub-contract work sought.
6. Notwithstanding the above, the County or the single-prime contractor shall not be required to award contracts or subcontracts to or to make purchases of materials or equipment from minority-business contractors or minority-business subcontractors who do not submit the lowest responsible bid or bids or who do not comply with the provisions of the Request For Bids or the applicable statutory provisions.
7. The Clerk to the Board is hereby authorized and directed to provide a certified copy of the Resolution to the North Carolina Association of County Commissioners, North Carolina Commissioner of Labor, North Carolina Commissioner of Insurance, and the State Licensing Board for General Contractors.
8. This Resolution shall take effect upon its passage.

This the 18th day of December, 1989.

BRUNSWICK COUNTY BOARD OF COMMISIONERS

s/ L. E. Pinkerton, Chairman

ATTEST:

s/ Regina W. Alexander, Clerk

F O R M O F P R O P O S A L
Brunswick County Courthouse Addition & Renovations

To: **BRUNSWICK COUNTY**

From: *Bidder* _____

Address _____

_____

_____

Tele./Fax _____

Date of Bid _____

The undersigned, as bidder, hereby declares that the only person or persons interested in this proposal as principal or principals is or are named herein and that no other person than herein mentioned has any interest in this proposal or in the Contract to be entered into; that this proposal is made without connection with any other person, company, or parties making a bid or proposal; and that it is in all respects fair and in good faith without collusion or fraud. By signing this proposal, the bidder affirms they are not listed and will not utilize a subcontractor or vendor listed on the Final Divestment List created by the State Treasurer pursuant to NCGS 143-6A-4, Iran Divestment Act Certification. The Bidder further declares that he has examined the site of the work and the Contract Documents relative thereto, and has read all special provisions furnished prior to the opening of bids; that he has satisfied himself relative to the work to be performed.

The Bidder proposes and agrees if this proposal is accepted to Contract with **Brunswick County** in the form of Contract specified below, to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation, supplies, labor, etc. necessary to complete the construction of:

Brunswick County Courthouse Addition and Renovations

in full in complete accordance with the plans, specifications, and Contract Documents, to the full and entire satisfaction of **Brunswick County** and their representatives with a definite understanding that no money will be allowed for extra work except as set forth in the General Conditions and the Contract Documents, for the sum of:

SINGLE PRIME CONTRACT: _____

Base Bid:

All work covered in the Contract Documents **including** unit price items.

_____ Dollars($) _____

General Subcontractor: Plumbing Subcontractor:

_____Lic_____ _____Lic_____

Mechanical Subcontractor: Electrical Subcontractor:

_____Lic_____ _____Lic_____

When the project is a Building, NCGS 143-128(d) requires all Single Prime Bidders to identify their Subcontractors for the above subdivisions of work. A Contractor whose bid is accepted shall not substitute any person as Subcontractor in the place of the Subcontractor listed in the original bid, except in accordance with NCGS 143-128(d).

ALTERNATES:

Should any of the alternates as described in the Contract Documents be accepted, the amount written below shall be the amount to be "added to" the base bid.

GENERAL CONTRACT:

Alternate No. G-1 Existing Building South Elevation Renovations :

State the amount to add to the base bid for removal of precast wall panels, new cast inplace wall panel with openings, aluminum curtain wall and glazing as shown. Refer to drawings 2-A2.1, 1-A3.2 and all details on sheet A5.3.

_____Dollars($)_____

Alternate No. G-2 Records Room 3018

State the amount to add to the base bid for reinforcing the existing floor structure under the mobile storage shelving as shown and noted on sheet S1.3. Also include in this alternate bid the cost to furnish and install the mobile storage shelving system shown on sheet A1.2 and specified in specification section 10 5626.

_____Dollars($)_____

Alternate No. G-3 Exit Turnstile, Main Entrance 1000

State the amoun to add to the base bid for furnishing and installing the exit turnstiles and adjacent railings. Refer to specification section 11 1420. This alternate bid includes the electrical power circuit, chasing and repairing the flooring.

_____Dollars($)_____

UNIT PRICES

Unit prices quoted shall apply throughout the life of the Contract. Unit prices shall be applied, as appropriate, to compute the total value of **changes** in the scope of the work all in accordance with the Contract Documents.

Unit price No. 1

Remedial Floor Coating, specification Section 09 0561 - Common Work Results for Flooring Preparation. State the cost per square yard for this floor preparation.

Dollars per Square Yard ($) _____

Unit price No. 2

Communications, voice / data outlet box and conduit rough in. specification Section 26 0533. State the amount per wall outlet box and conduit raceway to above ceiling. This unit cost will be used if outlets are added to or deleted from the project

Dollars per voice / data outlet ($) _____

ATTACHED DOCUMENTS

The following documents are attached to and made a condition of this Bid:

- Bid Security
- Identification of Minority Business Participation form
- MBE Affidavit A (Listing of Good Faith Efforts) or Affidavit B (Intent to Perform Contract with Own Workforce)

The bidder further proposes and agrees hereby to commence work under this Contract on a date to be specified in a written order of the Designer and shall fully complete all work thereunder within the time specified in the Notice to Bidders. Applicable liquidated damages amount is also stated in the Notice to Bidders (see General Conditions “Time of Completion, Delays, Extension of Time”.)

MINORITY BUSINESS PARTICIPATION REQUIREMENTS:

Provide with the bid - Under NCGS 143-128.2(c) the undersigned Bidder shall identify **on its bid** (Identification of Minority Business Participation Form) the minority businesses that it will use on the project with the total dollar value of the bids that will be performed by the minority businesses. **Also** list the good faith efforts (Affidavit **A**) made to solicit minority participation in the bid effort.

> **NOTE**: A Contractor that performs all of the work with its own workforce may submit an Affidavit **B** to that effect in lieu of Affidavit **A** required above. The Minority Business Participation Form must still be submitted even if there is zero participation.

After the bid opening - The Owner will consider all bids and alternates and determine the lowest responsible, responsive bidder. Upon notification of being the apparent low Bidder, the Bidder shall then file within seventy-two (72) hours of the notification of being the apparent lowest Bidder, the following:

An Affidavit **C** that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total Contract price, which is equal to or more than the goal established as indicated in the Notice to Bidders. This affidavit shall give rise to the presumption that the Bidder has made the required good faith effort and Affidavit **D** is not necessary;

OR

If less than the goal, Affidavit **D** of its good faith effort to meet the goal shall be provided. The document must include evidence of all good faith efforts that were implemented, including any advertisements, solicitations, and other specific actions demonstrating recruitment and selection of minority businesses for participation in the Contract.

Note: Bidders must always submit **with their bid** the Identification of Minority Business Participation Form listing all Minority Business contractors, vendors, and suppliers that will be used. If there is no Minority Business participation, then enter none or zero on the form. Affidavit A **or** Affidavit B, as applicable, also must be submitted with the bid. Failure to file a required affidavit or documentation with the bid or after being notified apparent low Bidder is grounds for rejection of the bid.

Proposal Signature Page

The undersigned further agrees that in the case of failure on his part to execute the said Contract, provide performance and payment bonds, and certificates of insurance within ten (10) consecutive calendar days after being given written notice of the award of Contract, the certified check, cash, or bid bond accompanying this bid shall be paid into the funds of the Owner's account set aside for the project, as liquidated damages for such failure; otherwise the certified check, cash, or bid bond accompanying this proposal shall be returned to the undersigned.

Respectfully submitted this day of _____

_____
(Name of Firm or Corporation Making Bid)

WITNESS:

By: _____
Signature

_____
(Proprietorship, Partnership, or LLC)

Name: _____
Print or Type

Title: _____
(Owner/Co-Partner/President/Vice President/Manager)

Address: _____

ATTEST:

_____

By: _____

License No. _____

Title: _____
(Corp. Sec. or Asst. Sec. only)

Federal I.D. No. _____

(CORPORATE SEAL)

Addendum received and used in computing bid:

Addendum No. 1 _____ Addendum No. 3 _____ Addendum No. 5_____ Addendum No. 7_____

Addendum No. 2 _____ Addendum No. 4 _____ Addendum No. 6 _____ Addendum No. 8 _____

FORM OF BID BOND

BIDDER *(Name and Address)*:

_____

_____

_____

SURETY *(Name and Address of Principal Place of Business)*:

_____

_____

_____

OWNER:

Brunswick County
P. O. Box 249
Bolivia, NC 28422

BID

BID DUE DATE: _____

PROJECT

Brunswick County Courthouse Addition & Renovations
Bolivia, NC

BOND

BOND NUMBER: _____

DATE: *(Not Later than Bid Due Date)*: _____

PENAL SUM: _____

IN WITNESS WHEREOF, Surety and Bidder, intending to be legally bound hereby, subject to the terms of the Contract Documents, do each cause this Bid Bond to be duly executed on its behalf by its authorized officer, agent, or representative. THE CONDITION OF THE ABOVE OBLIGATION is such, that if the Bidder shall be awarded the Contract for which the bid is submitted and shall execute the Contract and give bond for the faithful performance thereof within ten (10)days after the award of same to the Bidder, then this obligation shall be null and void; but if the Bidder fails to so execute such Contract and give performance bond as required by NCGS 143-129, the surety shall, upon demand, forthwith pay to the Owner the penal sum amount set forth above. Provided further, that the bid may be withdrawn as provided by NCGS 143-129.1

BIDDER	SURETY
_____ (Seal)	_____ (Seal)
Bidder's Name and Corporate Seal	Surety's Name and Corporate Seal
By: _____	By: _____
Signature and Title	Signature and Title (Attach Power of Attorney)
Attest: _____	Attest: _____
Signature and Title	Signature and Title

Note: (1) Above addresses are to be used for giving required notice.
(2) Any singular reference to Bidder, Surety, Owner, or other party shall be considered plural where applicable.

Brunswick County Courthouse Addition & Renovations

Identification of Minority Business Participation

I,_____,
(Name of Bidder)

do hereby certify that on this project, we will use the following Minority Business Enterprises (MBE) as construction subcontractors, vendors, suppliers, or providers of professional services.

Firm Name, Address, and Phone #	Work Type	*Minority Category

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

The total value of minority business contracting will be ($)_____.

Brunswick County AFFIDAVIT A – Listing of Good Faith Efforts

(Name of Bidder)

Affidavit of_____

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 NC Administrative Code 30 I.0101)

- ☐ **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 ten (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 ten (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 that provide assistance in recruitment of minority businesses.
- ☐ **5 – (10 pts)** Attended pre-bid meetings scheduled by the 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.
- ☐ **11 – (20 pts)** A minimum of two (2) or all, if only one (1) is indicated, of the MBE firms indicated on the "Identification of Minority Business Participation" form are **Brunswick County** based.

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. Substitution of Contractors must be in accordance with NCGS143-128.2(d) Failure to abide by this statutory provision will constitute a breach of the Contract.

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_____, County of_____

Subscribed and sworn to before me this _____day of _____20____

Notary Public_____

My commission expires _____

Brunswick County AFFIDAVIT B – Intent to Perform Contract with Own Workforce

Affidavit of_____
(Name of Bidder)

I hereby certify that it is our intent to perform one hundred percent (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 _____, County of _____

Subscribed and sworn to before me this _____day of _____20___

Notary Public _____

My commission expires_____

Brunswick County AFFIDAVIT C – Portion of the Work to be Performed by Minority Firms

(Note this form is to be submitted only by the apparent lowest responsible, responsive Bidder.)

If the portion of the work to be executed by minority businesses as defined in NCGS143-128.2(g) is equal to or greater than the percentage goal listed in the Notice to Bidders of the Bidders total Contract price, then the Bidder must complete this affidavit. This affidavit shall be provided by the apparent lowest responsible, responsive bidder within **seventy-two (72) hours** after notification of being low Bidder.

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

_____
(Project Name)

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 #	*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 NCGS143-128.2(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_____, County of _____

Subscribed and sworn to before me this _____day of _____20_____

Notary Public_____

My commission expires_____

Do not submit with bid Do not submit with bid Do not submit with bid Do not submit with bid

Brunswick County AFFIDAVIT D – Good Faith Efforts

(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the percentage goal of participation by minority business listed in the Notice to Bidders **is not** achieved, the Bidder shall provide the following documentation to the Owner of his good faith efforts:

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

_____
(Project Name)

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 #	*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**)

Examples of documentation that may be required to demonstrate the Bidder's good faith efforts to meet the goals set forth in these provisions include, but are not necessarily limited to, the following:

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.

Pursuant to NCGS143-128.2(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 _____, County of _____

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

Notary Public_____

My commission expires _____

Do not submit with bid Do not submit with bid Do not submit with bid Do not submit with bid

NOTICE OF AWARD

Dated _____, 20 ____

To: _____
(BIDDER)

Address: _____

_____

_____

Owner: **BRUNSWICK COUNTY**

Owner's Contract No. **N/A**

Project: _____

Brunswick County Courthouse Addition & Renovations

You are hereby notified that your bid dated _____, 20____ for the above described project has been considered and has been accepted by the Owner.

The amount of your Contract is: _____

_____ Dollars ($_____)

Enclosed with this Notice of Award are the following:

Form of Performance Bond, Form of Payment Bond, and Certificate of Insurance.

You must comply with the following conditions precedent within twelve (12) days of the date of this Notice of Award, that is by:
_____, 20 ____

1. You must execute the contract by electronic signature. A Docu-sign email with an electronic form of construction contract has been/will be sent to you for electronic signature.

2. You must deliver to the Owner 2 each of the fully executed Performance Bond, Payment Bond, and Form of Insurance. Each of the Documents must bear your signature.

3. List other condition precedents:

None

_____

_____

_____

Do not submit with bid Do not submit with bid Do not submit with bid Do not submit with bid

Failure to comply with these conditions within the time specified will entitle Owner to consider your bid in default, to annul this Notice of Award and to declare your Bid Security forfeited.

After you have satisfactorily complied with the above conditions, Owner will return to you a fully signed copy of the Contract.

BRUNSWICK COUNTY
(OWNER)

By: _____
(AUTHORIZED SIGNATURE)

_____
(TITLE)

ACCEPTANCE OF AWARD

_____
(CONTRACTOR)

By: _____
(AUTHORIZED SIGNATURE)

_____
(TITLE)

_____
(DATE)

COPY to ENGINEER
(Use Certified Mail, Return Receipt Requested)

Name:
Address:

NORTH CAROLINA **CONSTRUCTION OR REPAIR AGREEMENT**
[Standard]

BRUNSWICK COUNTY

THIS CONSTRUCTION OR REPAIR AGREEMENT (hereinafter referred to as the "Agreement" or "Contract") is made and entered into by and between Brunswick County, a body politic and corporate of the State of North Carolina, (hereinafter referred to as "County" or "Owner"), party of the first part, and {Vendor Name}, (hereinafter referred to as "Contractor"), party of the second part.

WITNESSETH:

1. PROJECT; FEES

Contractor shall furnish and deliver all materials and perform all work in the manner and form as provided by enumerated plans, specifications and documents, including, without limitation and as applicable: the Invitation to Bid; Notice to Bidders; Instructions to Bidders; General Conditions; Supplementary General Conditions; Specifications; Addenda; Accepted Proposal; Notice to Proceed; Performance Bond; Payment Bond; MBE forms; Power of Attorney; Workers' Compensation, Public Liability, Property Damage and Builder's Risk Insurance Certificates; Approval by the Board of Commissioners; Tax Statement and Certification; Notice of Substantial Completion; Notice of Final Completion and Acceptance; and Drawings (hereinafter referred to collectively as the "Bid Documents") titled:

Project: Brunswick County Courthouse Addition & Renovations

Consisting of the following drawings and specifications: Drawing index attached as exhibit 1A
Specifications table of contents attached as exhibit 1B

dated September 23, 2019

And the following addenda:

Addendum No.	**{Addendum No. 1}**	Dated:	**{Date of Addendum No. 1}**
Addendum No.	**{Addendum No. 2}**	Dated:	**{Date of Addendum No. 2}**
Addendum No.	**{Addendum No. 3}**	Dated:	**{Date of Addendum No. 3}**
Addendum No.	**{Addendum No. 4}**	Dated:	**{Date of Addendum No. 4}**
Addendum No.	**{Addendum No. 5}**	Dated:	**{Date of Addendum No. 5}**
Addendum No.	**{Addendum No. 6}**	Dated:	**{Date of Addendum No. 6}**

The Bid Documents are incorporated by reference and made an integral part of this Agreement. To the extent the terms of such documents conflict with the terms of this Agreement, the terms of this Agreement shall prevail.

2. TERM OF AGREEMENT

The term of this Agreement begins upon issuance of the Notice to Proceed by Brunswick County (the "Effective Date") and continues in effect for Seven hundred twenty (720) consecutive calendar days, unless extended or sooner terminated as provided for in the Brunswick County General Conditions of the Contract.

3. BRUNSWICK COUNTY GENERAL CONDITIONS OF THE CONTRACT

This Agreement, in addition to any construction documents prepared hereunder, shall be subject to the Brunswick County, North Carolina General Conditions of the Contract (for construction contracts), unless the County directs otherwise. In the event of a conflict between the General Conditions of the Contract and this Agreement, this Agreement shall prevail.

4. NONAPPROPRIATION

If the Board of County Commissioners does not appropriate the funding needed by the County to make payments under this Agreement for a given fiscal year, the County will not be obligated to pay amounts due beyond the end of the last fiscal year for which funds were appropriated. In such event, the County will promptly notify the Contractor of the non-appropriation and this Agreement will be terminated at the end of the last fiscal year for which funds were appropriated. No act or omission by the County which is attributable to non-appropriation of funds shall constitute a breach of or default under this Agreement.

5. COMPENSATION

The County agrees to pay Contractor the total amount of **{Contract Amount - Alpha} Dollars (${Contract Amount - Numeric})** for the Project. Payment shall be subject to additions and deductions as provided in the specifications or Bid Documents. County shall make monthly progress payments to Contractor on the basis of a duly certified and approved estimate of work performed during a given calendar month, less five percent (5%) of the amount of such estimate which is to be retained by County until all work has been performed strictly in accordance with this Agreement and such work has been accepted by County. The County shall not require further retainage after fifty percent (50%) of the work has been satisfactorily completed on schedule as more fully set forth in the General Conditions included with the Bid Documents. County shall make full and final payment to Contractor within thirty (30) days after completion of the Project and acceptance of such work by County and upon Contractor's submittal of satisfactory evidence that all payrolls, material bills and other costs incurred in connection with the Project have been paid in full. Notwithstanding the foregoing, County will not pay late fees on any charges under this Agreement. If County disputes any portion of the charges, the County shall inform Contractor in writing of the disputed charges.

6. INDEPENDENT CONTRACTOR

Both County and Contractor agree that Contractor shall act as an independent contractor and shall not represent itself as an agent or employee of the County for any purpose in the performance of its duties under this Agreement. Contractor represents that it has or will secure, at its own expense, all personnel required in performing the work under this Agreement. Accordingly, Contractor shall be responsible for payment of all federal, state and local taxes arising out of its activities in accordance with this Agreement, including, without limitation, federal and state income tax, social security tax, unemployment insurance taxes and any other taxes or business license fees as required. Contractor shall not be entitled to participate in any plans, arrangements or distributions by the County pertaining to or in connection with any pension, stock, bonus, profit sharing or other benefit extended to County employees.

In the event the Internal Revenue Service should determine that Contractor is, according to Internal Revenue Service guidelines, an employee subject to withholding and social security contributions, then Contractor hereby acknowledges that all payments hereunder are gross payments, and the Contractor is responsible for all income taxes and social security payments thereon.

7. CONTRACTOR REPRESENTATIONS

(1) Contractor is a duly organized entity or corporation qualified to do business and in good standing under the laws of the State of North Carolina;

(2) Contractor has all requisite corporate power and authority to execute, deliver and perform its obligations under this Agreement;

(3) No approval, authorization or consent of any governmental or regulatory authority is required to be obtained or made by it in order for Contractor to enter into and perform its obligations under this Agreement;

(4) Contractor shall not violate any agreement with any third party by entering into or performing the work under this Agreement;

(5) Contractor will perform all work in conformity with the specifications and requirements of this Agreement;

(6) Unless otherwise agreed by the parties, Contractor agrees that all materials will be new and of good quality;

(7) The work provided by Contractor under this Agreement will not violate, infringe or misappropriate any patent, copyright, trademark or trade secret rights of any third party, or any other third-party rights (including without limitation non-compete agreements);

(8) Contractor will perform the work in a professional and workmanlike manner exercising reasonable care and diligence and will ensure that it adheres to the highest generally accepted standards in the industry when performing said work;

(9) Contractor acknowledges that if any specific licenses, certifications or related credentials are required in its performance of the work, it will ensure that such credentials remain current and active and not in a state of suspension or revocation; and

(10) Contractor shall ensure that whenever its employees or agents are on County property, they will strictly abide by all instructions and directions issued by the County with respect to rules, regulations, policies and security procedures applicable to work on the County's premises. Such rules, regulations, policies and security procedures shall include, but not be limited to: (i) not possessing any controlled substances; (ii) smoking only in designated smoking areas, if any; and (iii) not possessing weapons, except for weapons possessed by law enforcement officials.

8. NON-ENDORSEMENT AND PUBLICITY

County is not endorsing Contractor or its work, and Contractor is not permitted to reference this Agreement or County in any manner without the prior written consent of County. Notwithstanding the foregoing, the parties agree that Contractor may list the County as a reference in response to requests for proposals and may identify County as a customer in presentations to potential customers.

9. NON-EXCLUSIVITY

Contractor acknowledges that County is not obligated to contract solely with Contractor for the work covered under this Agreement.

10. DIVESTMENT FROM COMPANIES THAT BOYCOTT ISRAEL

Contractor hereby certifies that it has not been designated by the North Carolina State Treasurer as a company engaged in the boycott of Israel pursuant to N.C.G.S. § 147-86.81.

11. DEBARMENT

Contractor hereby certifies that neither it nor its principals are presently debarred, suspended, proposed for debarment, declared ineligible or voluntarily excluded from participation in this Agreement by any governmental department or agency. Contractor must notify County within thirty (30) days if debarred by any governmental entity during this Agreement.

12. MINORITY BUSINESS ENTERPRISES

Contractor will make a good faith effort to utilize Minority Business Enterprises (MBEs) per N.C. Gen. Stat. 143-128 as subcontractors in the performance of this Agreement.

13. WORKERS' COMPENSATION

To the extent required by law, Contractor shall comply with the North Carolina Workers' Compensation Act and shall provide for the payment of workers' compensation to its employees in the manner and to the extent required by such Act. In the event Contractor is excluded from the requirements of such Act and does not voluntarily carry workers' compensation coverage, Contractor shall carry or cause its employees to carry adequate medical/accident insurance to cover any injuries sustained by its employees or agents while fulfilling Contractor's obligations under this Agreement. Contractor agrees to furnish County proof of compliance with said Act or adequate medical/accident insurance coverage upon request.

14. TAXES

Contractor shall be responsible for paying all taxes, fees, assessments and premiums of any kind payable on its employees and operations. Contractor shall substantiate, on demand by the County, that all taxes and other charges are being properly paid.

15. COMPLIANCE WITH E-VERIFY PROGRAM

Pursuant to N.C.G.S. § 143-133.3, Contractor understands that it is a requirement of this Agreement that Contractor and its subcontractors must comply with the provisions of Article 2 of Chapter 64 of the North Carolina General Statutes. In doing so, Contractor agrees that, unless it is exempt by law, it shall verify the work authorization of its employees utilizing the federal E-Verify program and standards as promulgated and operated by the United States Department of Homeland Security, and Contractor shall require its subcontractors to do the same. Upon request, Contractor agrees to provide County with an affidavit of compliance or exemption.

16. CONFIDENTIAL INFORMATION

For purposes of this Agreement, the party disclosing Confidential Information is the "Discloser," and the party receiving Confidential Information is the "Recipient." "Confidential Information" shall mean any nonpublic information concerning the parties' respective businesses including, but not limited to, all tangible, intangible, visual, electronic, present or future information such as: (a) trade secrets; (b) financial information, including pricing; (c) technical information, including research, development, procedures, algorithms, data, designs and know-how; (d) business information, including operations, planning, marketing interests and products; and (e) the terms of any agreement between the parties and the discussions, negotiations and proposals related thereto. Confidential Information disclosed to the other party must be clearly identified. Written Confidential Information must be clearly marked in a conspicuous place with an appropriate legend identifying the information as "Confidential." Confidential Information that is not written must be identified as confidential at the time of disclosure and confirmed in writing delivered to Recipient within fifteen (15) days of disclosure.

The restrictions regarding the use and disclosure of Confidential Information do not apply to information that is:

(1) in the public domain through no fault of the Recipient;

(2) within the legitimate possession of the Recipient, with no confidentiality obligations to a third party;

(3) lawfully received from a third party having rights in the information without restriction, and without notice of any restriction against its further disclosure;

(4) independently developed by the Recipient without breaching this Agreement or by parties who have not had, either directly or indirectly, access to or knowledge of the Confidential Information;

(5) disclosed with the prior written consent of the Discloser; or

(6) required to be disclosed by law, regulation or court or governmental order, specifically including requests pursuant to the Public Records Laws of North Carolina contained in Chapter 132 of the North Carolina General Statutes. In the event Recipient receives such a request, it shall notify Discloser and Discloser shall have the opportunity to defend against production of such records at Discloser's sole expense.

17. NO ASSIGNMENT WITHOUT CONSENT

Neither party shall assign this Agreement (or assign any right or delegate any obligation contained herein whether such assignment is of service, of payment or otherwise) without the prior written consent of the other party hereto. Any such assignment without the prior written consent of the other party hereto shall be void. An assignee shall acquire no rights, and County shall not recognize any assignment in violation of this provision.

18. GOVERNING LAW AND VENUE

This Agreement shall be governed by applicable federal law and by the laws of the State of North Carolina without regard for its choice of law provisions. All actions relating in any way to this Agreement shall be brought in the General Court of Justice of the State of North Carolina in Brunswick County or in the Federal District Court for the Eastern District of North Carolina, Wilmington division.

19. DISPUTE RESOLUTION

Should a dispute arise as to the terms of this Agreement, both parties agree that neither may initiate binding arbitration. The parties may agree to non-binding mediation, as more fully set forth in the General Conditions of the Contract.

20. GOVERNMENTAL IMMUNITY

County, to the extent applicable, does not waive its governmental immunity by entering into this Agreement and fully retains all immunities and defenses provided by law with regard to any action based on this Agreement.

21. NON-WAIVER

Failure by County at any time to require the performance by Contractor of any of the provisions of this Agreement shall in no way affect County's right hereunder to enforce the same, nor shall any waiver by County of any breach be held to be a waiver of any succeeding breach or a waiver of this Section.

22. ENTIRE AGREEMENT

This Agreement constitutes the entire agreement between the parties with respect to the subject matter herein. There are no other representations, understandings or agreements between the parties with respect to such subject matter. This Agreement supersedes all prior agreements, negotiations, representations and proposals, written or oral, related specifically to the Project herein.

23. HEADINGS

The headings in this Agreement are for convenience of reference only and shall not define or limit any of the terms or provisions hereof.

24. SEVERABILITY

The invalidity of one or more of the phrases, sentences, clauses or sections contained in this Agreement shall not affect the validity of the remaining portion of the Agreement so long as the material purposes of this Agreement can be determined and effectuated. If a provision of this Agreement is held to be unenforceable, then both parties shall be relieved of all obligations arising under such provision, but only to the extent that such provision is unenforceable, and this Agreement shall be deemed amended by modifying such provision to the extent necessary to make it enforceable while preserving its intent.

25. AMENDMENTS

Amendments or changes to this Agreement shall not be valid unless in writing and signed by authorized agents of both Contractor and County.

26. NOTICES

(1) **DELIVERY OF NOTICES.** Unless otherwise specified in the General Conditions, any notice, consent or other communication required or contemplated by this Agreement shall be in writing, and shall be delivered in person, by U.S. mail, by overnight courier, by electronic mail or by facsimile to the intended recipient at the address set forth below.

(2) **EFFECTIVE DATE OF NOTICES.** Any notice shall be effective upon the date of receipt by the intended recipient; provided that any notice which is sent by facsimile or electronic mail shall also be simultaneously sent by mail deposited with the U.S. Postal Service or by overnight courier.

(3) **NOTICE ADDRESS.**

a. Communications that relate to any breach, default, termination, amendment or waiver of any provision of this Agreement shall be sent to:

For the County: Brunswick County Attorney
P.O. Box 249
Bolivia, NC 28422

With a copy to: {County Contact for Notices}
{County Contact Title}
{Contact Address}
{Contact City}, {Contact State} {Contact Zip}

b. Communications that relate to any delay in performance, prevention of performance, modification or extension of this Agreement shall be sent to:

For the County: {County Contact for Notices}
{County Contact Title}
{Contact Address}
{Contact City}, {Contact State} {Contact Zip}

c. All communications to Contractor shall be sent to:

For the Contractor: {Vendor Name}
{Vendor Address}
{Vendor City}, {Vendor State or Territory} {Vendor Zip}

27. SIGNATURES

This Agreement, together with any amendments or modifications, may be executed in one or more counterparts, each of which shall be deemed an original and all of which shall be considered one and the same agreement. This Agreement may also be executed electronically. By signing electronically, the parties indicate their intent to comply with the Electronic Commerce in Government Act (N.C.G.S § 66-358.1 et seq.) and the Uniform Electronic Transactions Act (N.C.G.S § 66-311 et seq.). Delivery of an executed counterpart of this Agreement by either electronic means or by facsimile shall be as effective as a manually executed counterpart.

ATTEST:

_____
Clerk to the Board

BRUNSWICK COUNTY

By: _____
Frank Williams
Chairman

[SEAL]

{VENDOR NAME}

By: _____

Printed Name: {Vendor Signatory Name}

Title: {Vendor Signatory Title}

Date: _____

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

_____
Julie A. Miller, Finance Director
Brunswick County, North Carolina

APPROVED AS TO FORM

_____
Brunswick County Attorney/Asst Attorney

FORM OF PERFORMANCE BOND

Date of Contract: _____

Date of Execution: _____

Name of Principal: (Contractor) _____

Name of Surety: _____

Name of Contracting Body: _____

Amount of Bond: _____

Project: Brunswick County Courthouse Addition & Renovations

KNOW ALL MEN BY THESE PRESENTS, that we, the PRINCIPAL and SURETY above named, are held and firmly bound unto the above named contracting body, hereinafter called the contracting body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind, ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain Contract with the contracting body, identified as shown above and hereto attached:

NOW, THEREFORE, if the principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of said Contract during the original term of said Contract and any extensions thereof that may be granted by the contracting body, with or without notice to the surety, and during the life of any guaranty required under the Contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of any and all duly authorized modifications of said Contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Executed in _____ counterparts.

Witness:

_____
(Proprietorship or Partnership)

Attest: (Corporation)

_____
Contractor: (Trade or Corporate Name)

By: _____

Title: _____
(Owner, Partner, or Corp.
President or Vice President Only)

By: _____

Title: _____
(Corp. Sec. or Asst. Sec. Only)

(Corporate Seal)

_____
(Surety Company)

Witness:

_____

By: _____

Title: _____
(Attorney in Fact)

Countersigned:

_____

_____
(N.C. Licensed Resident Agent)

_____

_____
(Name and Address-Surety Agency)

_____

_____
(Surety Company Name and N.C.
Regional or Branch Office Address

(Surety Corporate Seal)

FORM OF PAYMENT BOND

Date of Contract: _____

Date of Execution: _____

Name of Principal (Contractor) _____

Name of Surety: _____

Name of Contracting Body: _____

Amount of Bond: _____

Project: Brunswick County Courthouse Addition & Renovations

KNOW ALL MEN BY THESE PRESENTS, that we, the PRINCIPAL and SURETY above named, are held and firmly bound unto the above named contracting body, hereinafter called the contracting body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain Contract with the contracting body identified as shown above and hereto attached:

NOW, THEREFORE, if the principal shall promptly make payment to all persons supplying labor/material in the prosecution of the work provided for in said Contract, and any and all duly authorized modifications of said Contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Executed in _____ counterparts.

Witness:

_____
Contractor: (Trade or Corporate Name)

_____
(Proprietorship or Partnership)

By: _____

Attest: (Corporation)

Title: _____
(Owner, Partner, or Corp. Pres. or Vice Pres. only)

By: _____

Title: _____
(Corp. Sec. or Asst. Sec. Only)

(Corporate Seal)

_____
(Surety Company)

Witness:

By: _____

_____

Title: _____
(Attorney in Fact)

Countersigned:

_____

(Surety Corporate Seal)

_____
(N.C. Licensed Resident Agent)

_____

_____
(Name and Address - Surety Agency)

_____

_____
(Surety Company Name and N.C. Regional or Branch Office Address)

Do not submit with bid Do not submit with bid Do not submit with bid Do not submit with bid

CERTIFICATE OF INSURANCE (Workmen's Compensation and Liability)

This certificate of insurance neither affirmatively nor negatively amends, extends, or alters the coverage afforded by the policy(ies) listed on this certificate.

Project Brunswick County Courthouse Addition & Renovations

Location Bolivia, NC

Owner Brunswick County **Address** P. O. Box 249; Bolivia, NC 28422

Contractor (Insured)_____

Address

_____

The undersigned hereby certifies that the following policies, subject to their terms, conditions, and exclusions have been issued by the named companies to the above insured and are presently in full force and effect:

A. WORKMEN'S COMPENSATION:
Policy No._____ **Expiration Date** _____
Insurance Co._____ **Address** _____

COVERAGE: Statutory Workmen's Compensation. Employers Liability Limit $_____ **Each Accident.**

Locations Covered: _____

B. COMPREHENSIVE GENERAL LIABILITY & PROPERTY DAMAGE:

Policy No._____ **Expiration Date**_____
Insurance Co._____ **Address** _____

LIMITS:
Bodily Injury, including Personal Injury.
$_____**Each Person** **Property Damage $**_____**Each Occurrence**
$_____**Each Occurrence** **$**_____**Aggregate**
$_____**Aggregate** **Other**

COVERAGE PROVIDED (Check Applicable Squares):

	Yes	No	Property Damage Liability Includes:	Yes	No
Premises Operations	☐	☐	Damage Due to Blasting (explosion)	☐	☐
Subcontractor Operations	☐	☐	Damage Due to Collapse	☐	☐
Personal Injury	☐	☐	Damage to Underground Facilities	☐	☐
Completed Operations	☐	☐	Broad Form Property Damage:	☐	☐
Contractual Liability (Per Spec)	☐	☐	Operations of Contractor	☐	☐
Other_____	☐	☐	Contractual	☐	☐

C. COMPREHENSIVE AUTOMOBILE LIABILITY & PROPERTY DAMAGE:
Policy No._____ **Expiration Date** _____
Insurance Co._____ **Address** _____

LIMITS:
Bodily Injury
$_____**Each Person** **Property Damage $**_____**Each Occurrence**
$_____**Each Occurrence** **Other**
$_____**Aggregate**

COVERAGE PROVIDED - for operation of all owned, non-owned, and hired vehicles.

D. UMBRELLA EXCESS LIABILITY:
Policy No._____ **Expiration Date** _____
Insurance Co._____ **Address** _____

LIMITS: Single Limit Bodily Injury and Property Damage $_____**Each Occurrence.**
COVERAGE PROVIDED - applies in excess of the coverages listed above for Employer's Liability, Comprehensive General, Automotive, and Property Damage Coverage.

The undersigned further certifies that in the event of cancellation or any material change in any of the above policies, thirty (30) days prior written notice of such cancellation or change shall be delivered by registered or certified mail to the above Owner.

Do not submit with bid Do not submit with bid Do not submit with bid Do not submit with bid

BRUNSWICK COUNTY, ITS OFFICERS, AGENTS AND EMPLOYEES ARE INCLUDED AS ADDITIONAL INSURED UNDER CONTRACTOR'S GENERAL LIABILITY INSURANCE

Name of Agency _____ **Address** _____
Date_____ **By** _____

NOTICE TO PROCEED

Dated _____, 20 _____

To: _____
(CONTRACTOR)

Address: _____

_____

Owner: **BRUNSWICK COUNTY**

Owner's Contract No. **N/A**

Project: Brunswick County Courthouse Addition & Renovations

_____

You are notified that the Contract times under the above Contract will commence to run on: _____.
By that date, you are to start performing your obligations under the Contract Documents. Your Contract completion date is therefore: _____.
The Contract provides for the assessment of liquidated damages for each consecutive calendar day that the work remains incomplete after the above established completion date.

Before you may start any Work at the site, you must deliver the required certificates of insurance to the Owner.

Also, before you may start any Work at the site, you must: (add other requirements)

_____

_____

_____

Brunswick County
(OWNER)

By: _____
(AUTHORIZED SIGNATURE)

_____
(TITLE)

BRUNSWICK COUNTY, NORTH CAROLINA

Brunswick County Courthouse Additions & Renovations
GENERAL CONDITIONS OF THE CONTRACT
Version date – May 2019

The use or reproduction of this document or any part thereof is authorized for and limited to use on projects of Brunswick County, North Carolina, and is distributed by, through, and at the discretion of Brunswick County, for that distinct and sole purpose.

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ARTICLE 1 – DEFINITIONS

Addenda shall mean written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the Contract Documents.

Approval means written or imprinted acknowledgement that materials, equipment, or methods of construction are acceptable for use in the Work.

Asbestos is any material that contains more than one percent (1%) asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

Bid shall mean the offer or proposal of a bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

Bidding Documents shall mean the Bidding Requirements and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

Bidding Requirements shall mean the Advertisement or Invitation to Bid, Instructions to Bidders, Bid security form, if any, MBE forms, and the Proposal form with any supplements.

Bonds shall mean performance and payment bonds and other instruments of security.

Change Order, as used herein, shall mean a written order to the Contractor subsequent to the signing of the Contract authorizing a change in the Contract (addition, deletion, or revision to Contract Price or Time of Completion). The Change Order shall be signed by the Contractor, Designer, and the Owner, and approved by the County Commissioners, in that order (see Article "Changes in the Work").

Claim shall mean a demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Time of Completion, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

Clarification or Request for Information (RFI) is a request from the Contractor seeking an interpretation or clarification by the Designer relative to the Contract Documents. The RFI, which shall be labeled (RFI), shall clearly and concisely set forth the issue or item requiring clarification or interpretation and why the response is needed. The RFI must set forth the Contractor's interpretation or understanding of the Contract Documents requirements in question, along with reasons for such an understanding.

Contract, as used herein, is the written instrument which is evidence of the agreement between Owner and Contractor covering the Work.

Contract Documents consist of the Invitation to Bid; Notice to Bidders; Instructions to Bidders; General Conditions of the Contract; special conditions if applicable; Supplementary General Conditions; the Drawings and Specifications, including all bulletins, Addenda or other modifications of the Drawings and Specifications incorporated into the documents prior to their execution; the accepted proposal; the Contract; the performance bond; the payment bond; insurance certificates; MBE forms; power of attorney; Notice to Proceed; Written Directives; Work Change Directives; Change Orders; Certificates of Substantial Completion; Notice of Final Completion and Acceptance; and approval of County Commissioners. All of these items together form the Contract. Approved shop Drawings are **not** Contract Documents.

Contract Price shall mean the moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents.

Contractor, as used herein, shall be deemed to be either of the several contracting parties called the "Party of the First Part" in either of the several contracts in connection with the total Project. Where, in special instances hereinafter, a particular Contractor is intended, an adjective precedes the word "Contractor," as "general," "heating," etc. For the purposes of a single prime contract, the term "Contractor" shall be deemed to be the single contracting entity identified as the "Party of the First Part" in the single Construction Contract. Any references or adjectives that name or infer multiple prime Contractors shall be interpreted to mean the single prime Contractor.

Day shall constitute a calendar day of twenty-four (24) hours measured from midnight to the next midnight.

Defective, when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it does not conform to the Contract Documents or does not meet the requirements of any inspection, reference standard, test, or approval referred to in the Contract Documents, or has been damaged prior to the Designer's recommendation of final payment.

Designer(s) are those referred to within this Contract, or their authorized representatives. The Designer(s), as referred to herein, shall mean architect and/or Engineer or other professional. They will be referred to hereinafter as if each were of the singular number, masculine gender. In instances where the Owner performs functions typically done by the Designer, references to the Designer may also refer to the Owner.

Drawings shall mean that part of the Contract Documents prepared or approved by Designer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.

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

"Equal to" or "Approved Equal" or "Or-Equal" shall mean materials, products, equipment, assemblies, or installation methods considered equal by the Owner in all characteristics (physical, functional, and aesthetic) to those specified in the Contract Documents.

Hazardous Environmental Condition shall mean the presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto in connection with the Work.

Hazardous Waste shall have the meaning provided in the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

Inspection shall mean examination or observation of Work completed or in progress to determine its compliance with the Contract Documents.

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

Liens, as used herein, shall mean charges, security interests, or encumbrances upon Project funds, real property, or personal property.

Liquidated Damages, as used herein, is an amount reasonably estimated in advance to cover the losses incurred by the Owner by reason of failure of the Contractor(s) to complete the Work within the time specified.

Milestone, as used herein, shall mean a principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

Notice of Award shall mean the Approval of the proposal by the Brunswick County Board of Commissioners at a public meeting or a signed "Notice of Award" form stating that upon timely compliance by the apparent successful bidder with the conditions precedent listed therein, Owner will execute the Contract.

Notice to Proceed shall mean a written notice given by Owner to Contractor fixing the date on which the time of completion will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.

Owner shall mean Brunswick County or any entity or department thereof. Typically, references to Owner shall refer to the County department responsible for overseeing the Work. However, the context may indicate the specific entity of the County referred to. The "County Commissioners" refers to the specific board in its official duty that governs County affairs and, based on context, may also be synonymous with the term "Owner."

Partial Utilization is use by Owner of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.

PCBs are polychlorinated biphenyls.

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

Project is the total construction Work to be performed under the Contract Documents by the various contractors.

Project Expediter, as used herein, is an entity stated in the Contract Documents, designated to effectively facilitate scheduling and coordination of Work activities. See Articles "Construction Supervision" and "Schedule" for responsibilities of a Project Expediter. **For the purposes of a single prime contract, the single prime Contractor shall be designated as the Project Expediter.**

Project Manual shall mean the bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.

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

Request for Payment shall mean the form acceptable to Designer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

Routine Written Communications Between the Designer and the Contractor are any communication other than a "request for information" provided in letter, memo, or transmittal format, sent by mail, courier, electronic mail, hand delivery, or facsimile. Written directives are included in this definition. Such communications cannot be identified as a "request for information."

Samples are physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

Shop Drawings are all Drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.

Site means lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.

Specifications are that part of the Contract Documents consisting of written technical descriptions of materials, equipment, systems, standards, and workmanship as applied to the Work and certain administrative details applicable thereto.

Subcontractor, as used herein, shall be understood to be one who has entered into a direct contract with a Contractor or another Subcontractor, and includes one who furnishes materials worked to a special design in accordance with plans and Specifications covered by the Contract, but does not include one who only sells or furnishes materials not requiring work so described or detailed.

Substantial Completion is the time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Designer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

"Substitution" or "Substitute" shall mean materials, products, equipment, assemblies, or installation methods deviating in at least one characteristic (physical, functional, or aesthetic) from those specified or deviating from the specific manufacturers listed in the Technical Specifications when "Only" the specific manufacturer is indicated as being acceptable. Substitutions shall, in the opinion of the bidder, improve competition and/or enhance the finished installation.

Supplementary Conditions are that part of the Contract Documents which amend or supplement these General Conditions.

Supplier is a manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or any Subcontractor.

Surety, as used herein, shall mean the bonding company or corporate body which is bound with and for the Contractor, and which engages to be responsible for the Contractor and his acceptable performance of the Work.

Time of Completion, as stated in the Contract Documents, is to be interpreted as consecutive calendar days measured from the date established in the written Notice to Proceed, or such other date as may be established herein (Article "Time of Completion, Delays, Extension of Time").

Underground Facilities are all underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

Unit Price Work is Work to be paid for on the basis of unit prices.

Work, as used herein as a noun, is intended to be the completed construction including materials, labor, and workmanship of the appropriate Contractor as required by the Contract Documents.

Work Change Directive, as used herein, shall mean a written statement to Contractor issued on or after the Effective Date of the Contract and signed by Owner and recommended by Designer ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Time of Completion but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Time of Completion.

Written Notice or Written Directive shall be defined as notice in writing delivered in person to the Contractor, or to a partner of the firm in the case of a partnership, or to a member of the contracting organization, or to an officer of the organization in the case of a corporation, or sent to the last known business address of the contracting organization.

ARTICLE 2 – TERMINOLOGY AND INTENT OF DOCUMENTS

A. The Contract Documents are complementary; what is called for by one is as binding as if called for by all. The intent of the Contract Documents is to establish the scope of all labor, materials, transportation, equipment, and any and all other things necessary to provide a complete job. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be provided whether or not specifically called for at no additional cost to the Owner.

B. In case of discrepancy or disagreement in the Contract Documents, the order of precedence shall be: Form of Contract, Instructions to Bidders, Notice to Bidders,

Invitation to Bid, Instructions to Bidders, Supplementary General Conditions, Specifications, General Conditions, large-scale Drawings, small-scale Drawings.

C. The wording of the Specifications shall be interpreted in accordance with common usage of the language except that words having a commonly used technical or trade meaning shall be so interpreted in preference to other meanings.

D. **Intent of Certain Terms or Adjectives**

Whenever in the Contract Documents the terms "as allowed," "as approved," or terms of like effect or import are used, or the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Designer as to the Work, it is intended that such action or determination will be solely to evaluate, in general, the completed Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to Designer any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of the Article "Designer's Status" or any other provision of the Contract Documents.

E. **Furnish, Install, Perform, Provide**

1. "Furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. "Install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. "Perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When "furnish," "install," "perform," or "provide" is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, "provide" is implied.

ARTICLE 3 – EXECUTION OF DOCUMENTS

The Contractor shall execute each copy of the proposal, Contract, performance bond and payment bond as follows:

A. If the documents are executed by a sole owner, that fact shall be evidenced by the word "Owner" appearing after the name of the person executing them.

B. If the documents are executed by a partnership, that fact shall be evidenced by the word "Co-Partner" appearing after the name of the partner executing them.

C. If the documents are executed on the part of a limited liability company, they shall be executed by a Manager with authority to commit the company to the Contract and the title of the office of such person shall appear after their signature.

D. If the documents are executed on the part of a corporation, they shall be executed by either the president or the vice president and attested by the secretary or assistant secretary in either case, and the title of the office of such persons shall appear after their signatures. The seal of the corporation shall be impressed on each signature page of the documents.

E. If the documents are made by a joint venture, they shall be executed by each member of the joint venture in the above form for sole owner, partnership, company, or corporation, whichever form is applicable to each particular member.

F. All signatures shall be properly witnessed.

G. If the Contractor's license is held by a person other than an owner, partner or officer of a firm, then the licensee shall also sign and be a party to the Contract. The title "Licensee" shall appear under his/her signature.

H. The bonds shall be executed by an attorney-in-fact. There shall be attached to each copy of the bond a certified copy of power of attorney properly executed and dated.

I. Each copy of the bonds shall be countersigned by an authorized individual agent of the bonding company licensed to do business in North Carolina. The title "Licensed Resident Agent" shall appear after the signature.

J. The seal of the bonding company shall be impressed on each signature page of the bonds.

K. The Contractor's signature on the performance bond and the payment bond shall correspond with that on the Contract.

ARTICLE 4 – REVIEW OF CONTRACT DOCUMENTS AND CLARIFICATIONS

A. **Contractor's Review of Contract Documents**. Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Designer any conflict, error, ambiguity, omission, or discrepancy which Contractor may discover and shall obtain a written interpretation or clarification from Designer before proceeding with any Work affected thereby; however, Contractor shall not be liable to Owner or Designer for failure to report any conflict, error, ambiguity, omission, or discrepancy in the Contract Documents unless Contractor knew or reasonably should have known thereof.

B. In such cases where the nature of the Work requires clarification by the Designer, such clarification shall be furnished by the Designer with reasonable promptness by means of written instructions or detail Drawings, or both. Clarifications and Drawings shall be consistent with the intent of Contract Documents, and shall become a part thereof.

C. The Contractor(s) and the Designer shall prepare, if deemed necessary, a schedule fixing dates upon which foreseeable clarifications will be required. The schedule will be subject to addition or change in accordance with progress of the Work. The Designer shall furnish Drawings or clarifications in accordance with that schedule. The Contractor shall not proceed with the Work without such detail Drawings and/or written clarifications.

D. Where needed Specifications or details are omitted from the Contract Documents, the Contractor shall promptly report such omissions to the Designer and wait for clarification before proceeding with the Work. Brunswick County details and Specifications, latest versions, will be used to determine Work description, materials, construction methods, and method of measurement, unless directed otherwise by the Designer.

ARTICLE 5 – SITE DOCUMENTATION

The Contractor is required to provide detailed video or photo documentation of Site conditions prior to mobilization. The extent of the Project Site shall be video/photo documented including, but not limited to: all access roads into and out of the Site, haul roads, existing utilities, staging and stockpile areas, culverts, bridges, drainage features, adjacent driveways, adjacent structures, existing facilities, stream and floodplains adjacent and immediately downstream of the Project area, and any other areas that might potentially be impacted by construction. Videos and photos shall have the dates and times taken digitally indicated.

ARTICLE 6 – REFERENCE TO STANDARDS, CODES, LAWS, AND REGULATIONS

A. Reference to standards, Specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

B. No provision of any such standard, specification, manual or code, or any instruction of a Supplier shall be effective to change the duties or responsibilities of Owner, Contractor, or Designer, or any of their Subcontractors, consultants, agents, or employees from those set forth in the Contract Documents, nor shall any such provision or instruction be effective to assign to Owner, Designer, or any of Designer's Consultants, agents, or employees any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

C. If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the Work or of any standard, specification, manual or code, or of any instruction of any Supplier, Contractor shall report it to Designer in writing at once. Contractor shall not proceed with the Work affected thereby (except in an emergency) until an amendment or supplement to the Contract Documents has been issued.

D. The Contractor shall give all notices and comply with all laws, ordinances, codes, encroachment agreements, rules and regulations bearing on the conduct of the Work under this Contract. Any necessary changes required after Contract award shall be made by Change Order in accordance with Article "Changes in the Work." If the Contractor performs any Work knowing it to be contrary to such laws, ordinances, codes, encroachment agreements, rules and regulations, and without such notice to the Designer, he shall bear all cost arising therefrom. Additional requirements implemented after bidding will be subject to equitable negotiations.

E. All Work under this Contract shall conform to the North Carolina State Building Code and other state, local and national codes as are applicable. The cost of all required inspections and permits shall be the responsibility of the Contractor.

ARTICLE 7 – PERMITS

Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening Bids, or, if there are no Bids, on the Effective Date of the Contract. Contractor shall pay all charges of utility owners for connections to the Work.

ARTICLE 8 – COPIES OF DESIGN DRAWINGS AND SPECIFICATIONS

The Designer shall furnish free of charge to the Contractors copies of plans and Specifications as follows:

A. General Contractor and single-prime Contractor - Up to five (5) sets of general Contractor Drawings and Specifications. One of these sets shall be used by the Contractor to clearly and legibly record all work-in-place that is at variance with the Contract Documents.

B. Each other Contractor - Up to five (5) sets of the appropriate Drawings and Specifications. One of these sets shall be used by the Contractor to clearly and legibly record all work-in-place that is at variance with the Contract Documents.

C. Additional sets shall be furnished at cost, including mailing, to the Contractor upon request by the Contractor.

ARTICLE 9 – APPROVING SUBSTITUTES AND "OR EQUAL" ITEMS

A. Products are generally specified by ASTM or other reference standard and/or by manufacturer's name and model number or trade name. When specified only by reference standard, the Contractor may select any product meeting this standard, by any manufacturer. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the general style, type, character, function, appearance, and quality required. Equivalent products are acceptable and bidders are not restricted to the specific brand, make, manufacturer or specific name unless the specification indicates that "only" the specific manufacturer is acceptable or the description contains words reading that no

like, equivalent, or substitution is permitted. Other items of material or equipment or material or equipment of other Suppliers may be submitted to Designer for review under the circumstances described below and as outlined in the Instructions to Bidders Article "Substitutions".

1. **"Or-Equal" Items:** In cases where the technical specification indicate a specific brand, if in the Designer's and Owner's discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Designer as an "or-equal" item, in which case review and approval of the proposed item may, in Designer's discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this paragraph a proposed item of material or equipment will be considered functionally equal to an item so named if:

    a. in the exercise of reasonable judgment Designer determines that: (i) it is at least equal in quality, durability, appearance, strength, and design characteristics; (ii) it will reliably perform at least equally well the function imposed by the design concept of the completed Project as a functioning whole, and;

    b. Contractor certifies that: (i) there is no increase in cost to the Owner; and (ii) it will conform substantially, even with deviations, to the detailed requirements of the item named in the Contract Documents.

2. **Substitute Items**

    a. If in Designer's and Owner's discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under the paragraph above, it will be considered a proposed substitute item.

    b. Request for substitution of materials, items, or equipment shall be submitted to the Designer for approval or disapproval ten days prior to the opening of bids. Substitution submittals made after this point shall be reviewed at the discretion of the Designer.

    c. Contractor shall submit sufficient information as provided below and as stated in the Instructions to Bidders to allow Designer to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Designer from anyone other than prime bidders.

    d. By making requests for substitutions, the Contractor:

        i. Represents that he has personally investigated the proposed substitute product and determined that it is of equal or superior in all aspects to that specified;

        ii. Represents that he will provide, at minimum, the same warranty for the substitute that he would for that specified.

        iii. Certifies that the cost of data presented is complete and includes all related costs under this Contract but excludes costs under separate contracts, and

excludes the Designers redesign costs, and waives all claims for additional costs related to the substitution which subsequently becomes apparent; and

iv. Will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.

B. **Preferred Brands:** In accordance with the provisions of NCGS 133-3 the Contract Documents may list one or more preferred brands to provide overall cost savings to the Owner and/or to maintain or improve the functioning of any process or system affected by the preferred item or items. The use of Preferred Brands on the Project is at the sole discretion of the Owner. In the event that the Contractor's proposal does not indicate an increased cost for the use of Preferred Brands, the Contractor shall use Preferred Brands on the Project, unless notified otherwise in writing by the Owner. The Owner's preference of Preferred Brands for specific items shall be stated in the Contract Documents, typically on an Approved Products List in the Supplementary General Conditions, the Proposal Form, or in the Technical Specifications. A bid alternate may be used on the Proposal Form to determine the cost difference between Preferred Brands and other products meeting the performance specification. Where there is a cost differential between a Preferred Brand item and the other equivalent item, the Contractor shall provide a listing of the equivalent item type, manufacturer, model, item number, and cost savings compared to using a Preferred Brand item. When Preferred Brands are indicated in the Contract Documents for specific items, but the Owner chooses not to require the use of Preferred Brands for a specific item, the Contractor is advised that any product submitted for use on the Project must still be approved in accordance with the section "Or-Equal Items".

C. **Substitute Construction Methods or Procedures:** If a specific means, method, technique, sequence, or procedure of construction is shown or indicated in and expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Designer. Contractor shall submit sufficient information to allow Designer, in Designer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents.

D. **Designer's Evaluation:** Designer will be allowed a reasonable time within which to evaluate each proposal or submittal. Designer will be the sole judge of acceptability. No "or-equal" or substitute will be ordered, installed, or utilized until Designer's review is complete, which will be evidenced by either a Directive for a substitute or an approved Shop Drawing for an "or-equal." Designer will advise Contractor in writing of any negative determination.

E. **Special Guarantee:** Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other Surety with respect to any substitute.

F. **Contractor's Expense:** Contractor shall provide all data, including any required engineering, in support of any proposed substitute or "or-equal" at Contractor's expense.

ARTICLE 10 – SHOP DRAWINGS, SUBMITTALS, SAMPLES, DATA

A. Within ten (10) consecutive calendar days after the Notice to Proceed, each prime Contractor shall submit a schedule for anticipated submittal of all Shop Drawings,

Product Data, Samples, and similar submittals to the Project Expediter and the Designer. This schedule shall indicate the items, relevant specification sections, other related submittal, data, and the date when these items will be furnished to the Designer.

B. The Contractor shall review, approve and submit to the Designer all Shop or Setting Drawings, Product Data, Samples, Color Charts, and similar submittal data required or reasonably implied by the Contract Documents. Shop Drawing submittals shall be made using the "Contractor Submittal" form and shall be made in accordance with the Project schedule. Required Submittals shall bear the Contractor's stamp of approval and any exceptions to the Contract Documents shall be noted on the submittals. A minimum of three (3) copies of each submittal shall be submitted to the Designer to retain and the Contractor shall supply, at the request of the Designer, additional copies as needed. Submittals shall be presented to the Designer with reasonable promptness and time so as to cause no delay in the activities of the Owner or of separate Contractors.

C. Shop Drawing submittals shall be complete with respect to quantities, dimensions, Drawings, specified performance, design criteria, and materials and shall be detailed sufficiently to enable the Designer to determine compliance with the Contract Documents.

D. The Designer shall review required submittals promptly, noting desired corrections if any, and returning a copy of the annotated Shop Drawings to the Contractor no later than twenty (20) days from the date of receipt by the Designer. When resubmittals are required, the submittal procedure shall be the same as for the original submittals. The Contractor shall not be entitled to any Time of Completion extension for review and approval of Shop Drawings by the Designer.

E. Approval of Shop Drawings by the Designer shall not be construed as relieving the Contractor from responsibility for compliance with the design or terms of the Contract Documents nor from responsibility of errors of any sort in the Shop Drawings, unless such lack of compliance or errors first have been called in writing to the attention of the Designer by the Contractor.

F. The Owner may assess the Contractor the cost of Shop Drawing review for Shop Drawing submittals in excess of three (3) for any one item.

ARTICLE 11 – REFERENCE POINTS AND CONSTRUCTION SURVEYING

A. Engineering surveys shall be provided to establish reference points for construction which in Designer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without prior written approval. Contractor shall report to Designer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by a registered professional surveyor.

B. The Contractor shall be responsible for all of the field horizontal layout and vertical control of the facilities. Construction Surveying shall include, but not be limited to,

furnishing personnel, all surveying equipment, stakes, layout drawings, calculations, stakeout records, all materials necessary to perform the surveying work, staking clearing limits, staking centerlines, miscellaneous staking necessary for construction, locating reference points and benchmarks, and any other survey incidental to construction. Unless directed otherwise by the Designer, Survey personnel shall be under the direct supervision of a North Carolina Registered Professional Land Surveyor in conformance with NCGS 89C. Benchmarks and reference points shall be indicated by a metal monument cap set on a minimum 36" long #5 reinforcing bar with an adjacent carsonite witness stake and shall be permanently preserved.

C. Upon completion of the stakeout and prior to beginning construction, the Contractor shall give the Designer a 48-hour notice in order to inspect the construction staking. The Designer's review of the Contractor's work in no way relieves the Contractor of responsibility for conformance with the Contract Documents. Failure by the Designer to point out unsatisfactory Work, from lack of discovery or for any other reason, in no way prevents later rejection or corrections to the unsatisfactory Work, when discovered, at no cost to the Owner. No claims will be allowed for losses suffered due to any necessary removal or repairs resulting from the unsatisfactory Work. When requested by the Designer, the accuracy of the stakeout will be checked by the Contractor.

D. When surveying is required that could not have been reasonably anticipated, the Contractor shall notify the Designer in writing prior to beginning such Work and will proceed according to the General Conditions of the Contract for "Claims for Extra Cost."

ARTICLE 12 – RECORD DRAWINGS AND SPECIFICATIONS AT THE JOB SITE

The Contractor shall maintain, in readable and secure condition at his job office, one complete set of the Contract Documents including record Drawings, Specifications, Addenda, Change Orders, Written Directives, Work Change Directives, and written interpretations and clarifications. Additionally, a copy of all Shop Drawings and the Project Manual shall be maintained at the job office. These materials shall be annotated to show changes made during construction. The Contractor shall maintain at the job office, a day-to-day record of work-in-place that is at variance with the Contract Documents. Such materials shall be made available for use by the Owner, Designer, or his authorized representative and shall be submitted to the Owner upon Project completion and prior to final payment.

ARTICLE 13 – AS-BUILT DRAWINGS

Unless otherwise indicated in the Supplementary General Conditions, the Contractor is responsible for furnishing certified "As-Built" Drawings in the form of signed and sealed (professional surveyor or professional engineer) plans per the North Carolina Board of Engineers and Surveyors guidelines. Electronic copies (Acrobat PDF file format and either MicroStation or Autocad format) and two (2) sets of photographic mylars or vellums shall be furnished to the Owner prior to final payment. As-built Drawings shall verify or adjust elevations, dimensions, locations, and materials incorporated into the completed Work.

ARTICLE 14 – OWNERSHIP OF WORK PRODUCT

All Drawings and Specifications (including electronic media) are instruments of service and remain the property of the Owner. The use of these instruments on Work other than this Contract without permission of the Owner is prohibited. Contractor and any Subcontractor or Supplier or other individual or entity performing or furnishing any of the Work under a direct or indirect contract with Owner: (i) shall not have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Designer or Designer's Consultant, including electronic media editions; and (ii) shall not reuse any of such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other Project without written consent of Owner. This prohibition will survive final payment, completion, and acceptance of the Work, or termination or completion of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes or for furnishing as-built Drawings. Any other documents generated by Contractor's performance hereunder shall become the property of Owner and may be used by Owner for this Project or future projects without additional compensation to Contractor. Owner acknowledges that its use of such documents on projects other than the Project covered by this Contract shall be at its own risk.

ARTICLE 15 – MATERIALS, EQUIPMENT, EMPLOYEES

A. The Contractor shall, unless otherwise specified, supply and pay for all labor, transportation, materials, tools, apparatus, lights, power, heat, sanitary facilities, water, scaffolding and incidentals necessary for the completion of his Work, and shall install, maintain and remove all equipment of the construction, other utensils or things, and be responsible for the safe, proper and lawful construction, maintenance and use of same, and shall construct in the best and most workmanlike manner, a complete job and everything incidental thereto, as shown on the plans, stated in the Specifications, or reasonably implied therefrom, all in accordance with the Contract Documents.

B. All materials shall be new and of quality specified, except where reclaimed material is authorized herein and approved for use. Workmanship shall at all times be of a grade accepted as the best practice of the particular trade involved, and as stipulated in written standards of recognized organizations or institutes of the respective trades except as exceeded or qualified by the Specifications.

C. Upon notice, the Contractor shall furnish evidence as to quality of materials.

D. Each Contractor shall obtain written approval from the Designer for the use of products, materials**,** equipment**,** assemblies or installation methods claimed as equal to those specified. Such approvals must be obtained as soon after Contract awards as possible and before any materials are ordered. Applications for approvals shall be made by the Contractor and not by Subcontractors or material Suppliers within thirty (30) days following award of Contract. When the submittal schedule provided under Article "Shop Drawings, Submittals, Samples, Data" Paragraph (A) is approved, no further substitutions will be permitted except in unusual or extenuating circumstances. If no list is submitted, the Contractor shall supply materials specified.

E. The Designer is the judge of equality for proposed substitution of products, materials or equipment.

F. If at any time during the construction and completion of the Work covered by these Contract Documents, the conduct of any workman of the various crafts be adjudged a nuisance to the Owner or Designer, or if any workman be considered detrimental to the Work, the Contractor shall order such parties removed immediately from grounds.

ARTICLE 16 – EQUAL OPPORTUNITY CLAUSE

The non-discrimination clause contained in Section 202 (Federal) Executive Order 11246, as amended by Executive Order 11375, relative to equal employment opportunity for all persons without regard to race, color, religion, sex, sexual orientation, gender identity or national origin, and the implementing rules and regulations prescribed by the Secretary of Labor, are incorporated herein. Contractor shall not discriminate against any employee or applicant for employment based on the foregoing or based on age, religion, disability, ancestry, citizenship, genetic information, political affiliation or military/veteran status or any other status protected by Laws or Regulations. Contractor shall take affirmative action to ensure that applicants are employed and that employees are treated fairly during employment. In the event Contractor is determined by the final order of an appropriate agency or court of competent jurisdiction to be in violation of any non-discrimination provision of any Laws or Regulations, the Contractor may be declared ineligible for future business opportunities with Owner.

ARTICLE 17 – EMPLOYMENT OF THE HANDICAPPED

The Contractor(s) agree not to discriminate against any employee or applicant for employment because of physical or mental handicap in regard to any position for which the employee or applicant is qualified. The Contractor agrees to take affirmative action to employ, advance in employment and otherwise treat qualified handicapped individuals without discrimination based upon their physical or mental handicap in all employment practices.

ARTICLE 18 – ROYALTIES, LICENSES, AND INTELLECTUAL PROPERTY

It is the intention of the Contract Documents that the Work covered herein will not constitute in any way infringement of any intellectual property right.. In addition to the indemnity provisions set forth herein, the Contractor shall protect and save harmless the Owner against suit on account of alleged or actual infringement. The Contractor shall pay all royalties and/or license fees required on account of any material protected by intellectual property laws, whether such rights are evidenced hereinafter.

ARTICLE 19 – USE OF PREMISES

A. **Owner shall furnish the Site**. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities.

B. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

C. The Contractor(s) shall confine his apparatus, the storage of materials and the operations of his workmen to limits indicated by law, ordinances, permits or directions of the Designer and shall not exceed those established limits in his operations.

D. The Contractor(s) shall not load or permit any part of any structure or property to be loaded with a weight that will endanger its safety or that of subsurface facilities.

E. The Contractor(s) shall enforce the all instructions regarding signs, advertisements, fires and smoking.

F. No firearms, any type of alcoholic beverages, or drugs (other than those prescribed by a physician) will be permitted at the Site.

ARTICLE 20 – SUBSURFACE AND PHYSICAL CONDITIONS

A. The Project Manual may contain reports, explorations, tests, or Drawings of subsurface conditions and subsurface structures at or contiguous to the Site. Contractor may rely upon the general accuracy of the "technical data" contained in such reports and Drawings, but such reports and Drawings are not Contract Documents. Such "technical data" is identified in the Project Manual. Except for such reliance on such "technical data," Contractor may not rely upon or make any Claim against Owner, Designer, or any Designer's Consultants with respect to:

1. The completeness of such reports and Drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

2. Other data, interpretations, opinions, and information contained in such reports or shown or indicated in such Drawings; or

3. Any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

B. **Differing Subsurface or Physical Conditions**

1. **Notice:** If Contractor believes that any subsurface or physical condition at or contiguous to the Site that is uncovered or revealed either:

   a. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as indicated above is materially inaccurate; or

   b. is of such a nature as to require a change in the Contract Documents; or

   c. differs materially from that shown or indicated in the Contract Documents; or

   d. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents; then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency), notify Owner and Designer in writing about such condition.

Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

C. **Designer's Review:** After receipt of written notice as required by above, Designer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Designer's findings and conclusions.

D. **Possible Price and Times Adjustments**

1. The Contract Price or the Time of Completion, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

   a. such condition must meet any one or more of the categories described above under "Differing Subsurface or Physical Conditions" and

   b. with respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract Price will be subject to the provisions of Unit Price Work.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Time of Completion if:

   a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner in respect of Contract Price and Time of Completion by the submission of a Bid or becoming bound under a negotiated contract; or

   b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or

   c. Contractor failed to give the written notice within the time and as required by the section "Differing Subsurface of Physical Conditions."

3. NOTE ON TRENCHLESS EXCAVATION (Horizontal Directional Drill, Bore & Jack, etc.) – Encountering rock or other hardened material during the installation of pipe by trenchless excavation methods shall not be considered a "Differing Subsurface Condition or Physical Condition" and no adjustment to the Contract Price or Time of Completion shall be approved. The Contractor is hereby notified that rock and other hardened material is routinely encountered in and around Brunswick County, NC. Per the "Instructions To Bidders", the Contractor is required to satisfy himself as to the nature of subsurface conditions and the Owner recommends that the Contractor perform subsurface investigation prior to submitting a bid.

4. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Time of Completion, or both, a Claim may be made therefor as provided elsewhere in the General Conditions. However, Owner, Designer, and Designer's Consultants shall not be

liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or other dispute resolution costs) sustained by Contractor on or in connection with any other Project or anticipated Project.

ARTICLE 21 – UNDERGROUND FACILITIES

A. **Shown or Indicated:** The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Designer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary General Conditions:

1. Owner and Designer shall not be responsible for the accuracy or completeness of any such information or data; and

2. The cost of all the following will be included in the Contract Price, and Contractor shall have full responsibility for:

   a. reviewing and checking all such information and data,

   b. locating all Underground Facilities shown or indicated in the Contract Documents and maintaining all utility markings (paintings, stakes, etc.) until the Owner provides written acceptance of the Project.

   c. coordination of the Work with the owners of such Underground Facilities, including Owner, prior to and during construction, and

   d. the safety and protection of Underground Facilities and repairing any damage resulting from the Work inclusive of required relocations, and

   e. the Contractor will be responsible for coordinating and obtaining approval for utility interruptions caused by the Work and for all costs associated with the repair and disruption of any underground utility facility.

B. **Not Shown or Indicated**

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency) identify the owner of such Underground Facility and give written notice to that owner and to Owner and Designer. Designer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

2. If Designer concludes that a change in the Contract Documents is required, a Work Change Directive or Written Directive, as applicable, will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Time of Completion, or both, to the extent that they are

attributable to the existence or location of any Underground Facility that was not shown or indicated in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Time of Completion, Owner or Contractor may make a Claim therefore as provided elsewhere in the General Conditions.

ARTICLE 22 – CUTTING, PATCHING, AND DIGGING

A. The Contractor shall do all cutting, fitting or patching of his work that may be required to make its several parts come together properly and fit it to receive or be received by work of other contractors shown upon or reasonably implied by the Drawings and Specifications for the completed structure, as the Designer may direct.

B. Any cost brought about by defective or ill-timed Work shall be borne by the party responsible therefore.

C. No Contractor shall endanger any Work of another Contractor by cutting, digging or other means. No Contractor shall cut or alter the Work of any other Contractor without the consent of the Designer and the affected Contractor(s).

ARTICLE 23 – UTILITIES, STRUCTURES, SIGNS

A. The Project Expediter shall provide necessary and adequate facilities for water, electricity, gas, oil, sewer, and other utility services, which may be necessary and required for completion of the Project. Any permanent meters installed shall be listed in the Project Expediter's name until his Work is fully accepted by the Owner. As stipulated in the Supplementary General Conditions, the Owner may: (1) pay utilities cost directly, (2) have the Project Expediter to pay all utilities cost, (3) or reimburse the Project Expediter for the actual cost of utilities. The Owner or Project Expediter, as applicable, may recover actual costs of metered utilities from the responsible party should delays occur in Project completion.

B. Meters shall be relisted in the Owner's name on the day following completion and acceptance of the Project Expediter's work, and the Owner shall pay for services used after that date.

C. The Owner shall be reimbursed for all metered utility charges after the meter is relisted in the Owner's name and prior to completion and acceptance of the Work of **all** contractors. Reimbursement shall be made by the Contractor whose work has not been completed and accepted. If the Work of two or more Contractors has not been completed and accepted, reimbursement to the Owner shall be paid by the Contractors involved on the basis of assessments by the Designer.

D. Prior to the operation of permanent systems, the Project Expediter will provide temporary power, lighting, water, and heat to maintain space temperature above freezing, as required for construction operations.

E. All Contractors shall have any permanent building systems in sufficient readiness for furnishing temporary climatic control at the time a building is enclosed and secured. The HVAC systems shall maintain climatic control throughout the enclosed portion

of the building sufficient to allow completion of the interior finishes of buildings. A building shall be considered enclosed and secured when windows**,** doorways (exterior, mechanical, and electrical equipment rooms), and hardware are installed**;** and other openings have protection which will provide reasonable climatic control. The appropriate time to start the mechanical systems and climatic condition shall be jointly determined by the Contractor(s) and the Designer. Use of the equipment in this manner shall in no way affect the warranty requirements of the Contractor(s).

F. The Electrical Contractor shall have any building's permanent power wiring distribution system in sufficient readiness to provide power as required by the HVAC Contractor for temporary climatic control.

G. The Electrical Contractor shall have any building's permanent lighting system ready at the time the general Contractor begins interior painting and shall provide adequate lighting in those areas where interior painting and finishing is being performed.

H. Each prime Contractor shall be responsible for his permanently fixed service facilities and systems in use during progress of the Work. The following procedures shall be strictly adhered to:

1. Prior to acceptance of Work by the Owner, each Contractor shall remove and replace any parts of the permanent building systems damaged through use during construction.

2. Temporary filters shall be installed in each of the heating and air conditioning units and at each return grille during construction. New filters shall be installed in each unit prior to the Owner's acceptance of the Work.

3. Extra effort shall be maintained to keep the building and the site adjacent to the building clean and under no circumstances shall air systems be operated if finishing and Site Work operations are creating dust in excess of what would be considered normal if the building were occupied.

4. It shall be understood that any warranty on equipment presented to the Owner shall extend from the day of final acceptance by the Owner. The cost of warranting the equipment during operation in the finishing stages of construction shall be borne by the Contractor whose system is utilized.

5. The Electrical Contractor shall have all lamps in proper working condition at the time of final Project acceptance.

I. The Project Expediter shall provide, if required and where directed, a shed for toilet facilities and shall furnish and install in this shed all water closets required for a complete and adequate sanitary arrangement. These facilities will be available to other contractors on the job and shall be kept in a neat and sanitary condition at all times. Chemical toilets are acceptable.

J. The Project Expediter shall, if required by the Supplementary General Conditions and where directed, erect a temporary field office, complete with lights, telephone, heat and air conditioning. A portion of this office shall be partitioned off, of sufficient size, for the use of a resident inspector, unless otherwise directed by the Designer.

K. On multi-story construction projects, the Project Expediter shall provide temporary elevators, lifts, or other special equipment for the general use of all contractors. The

cost for such elevators, lifts or other special equipment and the operation thereof shall be included in the Project Expediter's bid.

L. The Project Expediter will erect one sign on the Project, unless otherwise directed by the Designer. The sign shall be of sound construction neatly lettered with black letters on white background in accordance with Brunswick County standard details. The sign shall bear the name of the Project, and the names of prime Contractors on the Project, and the name of the Designer and consultants. Directional signs may be erected on the Owner's property subject to approval of the Owner with respect to size, style, and location of such directional signs. Such signs may bear the name of the Contractor and a directional symbol. No other signs will be permitted except by permission of the Owner.

ARTICLE 24 – HAZARDOUS ENVIRONMENTAL CONDITIONS

A. The Project Manual may contain reports, explorations, tests, or Drawings of known Hazardous Environmental Conditions at or contiguous to the Site. Contractor may rely upon the general accuracy of the "technical data" contained in such reports and Drawings, but such reports and Drawings are not Contract Documents. Such "technical data" is identified in the Project Manual. Except for such reliance on such "technical data," Contractor may not rely upon or make any Claim against Owner, Designer, or any Designer's Consultants with respect to:

1. the completeness of such reports and Drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such Drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

B. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.

C. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency); and (iii) notify Owner and Designer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Designer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any.

D. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered to Contractor written notice: (i) specifying that such condition

and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Time of Completion, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim as provided elsewhere in the General Conditions.

E. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Time of Completion as a result of deleting such portion of the Work, then either party may make a Claim as provided elsewhere in the General Conditions. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article "Owners Right to Do Work."

F. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner, Designer, Designer's Consultants, and the officers, directors, partners, employees, agents, other consultants, and Subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this paragraph shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

G. The Owner has attempted to address all asbestos-containing materials that are to be disturbed in the Project. However, there may be other asbestos-containing materials in the Work areas that are not to be disturbed and do not create an exposure hazard. Contractors are reminded of the requirements of instructions under Instructions to Bidders and General Conditions of the Contract, titled Examination of Conditions. Statute 130A, amended August 3, 1989, established the Asbestos Hazard Management Program that controls asbestos abatement in North Carolina. The latest edition of *Guideline Criteria for Asbestos Abatement* available from the NC State Construction Office is to be incorporated in all asbestos abatement projects for the Capital Improvement Program.

ARTICLE 25 – PROTECTION OF WORK AND PROPERTY

A. The Contractors shall be jointly responsible for the entire Site and the building or construction of the same and provide all the necessary protections, as required by the Owner or Designer, and by Laws or Regulations governing such conditions. They shall be responsible for any damage to the Owner's property, or of that of others on the job, by them, their personnel, or their Subcontractors, and shall make good such damages. They shall be responsible for and pay for any damages caused to the Owner. All Contractors shall have access to the Project at all times.

B. The Contractor shall provide cover and protect all portions of the structure when the Work is not in progress, provide and set all temporary roofs, covers for doorways,

sash and windows, and all other materials necessary to protect all the Work on the building, whether set by him, or any of the Subcontractors. Any Work damaged through the lack of proper protection or from any other cause, shall be repaired or replaced without extra cost to the Owner.

C. No fires of any kind will be allowed inside or around the operations during the course of construction without special permission from the Designer and Owner.

D. The Contractor shall protect all trees and shrubs designated to remain in the vicinity of the operations by building substantial boxes around same. All ornamental trees and landscaping shall be protected, whether such protection is indicated or not within the Contract Documents. If ornamental trees and landscaping plantings are in the way of construction, the Contractor shall remove, maintain, and reinstall at locations designated by the Designer. Any ornamental trees and landscaping plantings damaged or that die within the warranty period shall be replaced by the Contractor at the Contractor's expense. Where equipment must cross walks, landscaping areas, or ramps, the Contractor shall provide steel plates or minimum 3/4" plywood sheets for protection of these areas.

E. The Contractor shall barricade all walks, roads, etc., and any areas directed by the Designer to keep the public away from the construction. All trenches, excavations or other hazards in the vicinity of the Work shall be well barricaded and properly lighted at night.

F. In the event of emergency affecting the safety of life, the protection of Work, or the safety of adjoining properties, the Contractor is hereby authorized and is obligated to act at his own discretion, without further authorization from anyone, to prevent such threatened injury or damage. Any compensation claimed by the Contractor on account of such action shall be determined as provided for under Article "Changes in the Work," Paragraph (B).

ARTICLE 26 – SAFETY

A. The Contractor shall be solely responsible for initiating, maintaining, providing, and supervising all necessary safety precautions, safety programs, and safety measures for the protection of all persons on the job, including the requirements of the A.G.C. *Accident Prevention Manual in Construction*, as amended, and shall fully comply with all state Laws or Regulations and North Carolina State Building Code requirements to prevent accident or injury to persons on or about the location of the Work. He shall clearly mark or post signs warning of hazards existing, and shall barricade excavations, elevator shafts, stairwells and similar hazards. He shall protect against damage or injury resulting from falling materials and he shall maintain all protective devices and signs throughout the progress of the Work.

B. The Contractor shall adhere to the rules, regulations and interpretations of the North Carolina Department of Labor relating to Occupational Safety and Health Standards for the Construction Industry (Title 29, Code of Federal Regulations, Part 1926, published in Volume 39, Number 122, Part II, June 24, 1974, *Federal Register*), and revisions thereto as adopted by General Statutes of North Carolina 95-126 through 155.

C. The Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

D. The Contractor shall designate a qualified and experienced member of his organization as safety inspector, whose duties shall include accident prevention on the Work Project. The name of the safety inspector shall be made known to the Designer at the time the Work is started.

ARTICLE 27 – TRAFFIC CONTROL

A. The Contractor will be required to maintain traffic within the limits of the Project, including all existing roadways that cross or intersect the Project. To the extent dependent on the Contractor, the Contractor shall be responsible for maintaining in a safe, passable, and convenient condition all roads used by him during construction of the Project. Traffic shall be maintained from the time the Contractor begins Work on the Project Site until acceptance of the Project, including any periods during which the Contractor's operations are suspended. The Contractor shall conduct his Work in a safe manner that will create a minimum amount of inconvenience to traffic.

B. The Contractor shall be responsible for determining, utilizing, and maintaining traffic control measures as outlined in the *Manual on Uniform Traffic Control Devices (MUTCD*), latest version. Unless otherwise directed by the Designer, the Contractor is required to have an English copy of the *Manual on Uniform Traffic Control Devices (MUTCD)*, latest version, on the Project Site.

C. During the progress of any Work within road rights-of-way, mark all hazards with well-maintained signs, barricades, drums, or other warning or channelizing devices. At each location where Work is started which creates a safety hazard, continue the Work until completed to the extent that the safety hazard is eliminated. If the Work is not completed in a continuous manner to the extent that the safety hazard is eliminated, the Designer will not allow any other Work on the Project to be performed until the existing safety hazard is eliminated. During the process of excavating in a travelway or in the clear zone of a travelway where traffic is to be later maintained, make provisions to backfill and repair any excavated or damaged pavement before allowing traffic to proceed over the affected lanes. If not otherwise specified, the clear zone is the immediate area within 30" of the outside edge of lane. In low speed areas (35 MPH or less) metal plates may be used to cover excavated areas. Continuous, safe vehicular access shall be maintained to all residences, businesses, schools, police stations, fire stations, hydrants, other emergency services, hospitals, and mailboxes. Operations shall be conducted in a manner that limits inconvenience to property owners. When Work is not in progress, keep all personnel, equipment, machinery, tools, construction debris and supplies at least 40 feet away from active travel lanes. Personal vehicles shall not be parked adjacent to travelways in road rights-of-way.

D. During lane closures, all equipment and personnel shall operate within the designated Work area. Traffic control devices for lane closures shall be installed with the traffic flow, beginning with devices on the upstream side of traffic. Traffic control devices for lane closures shall be removed against the traffic flow, beginning with devices on the downstream side of traffic.

ARTICLE 28 – SEDIMENTATION POLLUTION CONTROL ACT OF 1973

A. Any land-disturbing activity performed by the Contractor(s) in connection with the Project shall comply with all erosion control measures set forth in the Contract Documents and any additional measures which may be required in order to ensure that the Project is in full compliance with the Sedimentation Pollution Control Act of 1973, as implemented by Title 15, North Carolina Administrative Code, Chapter 4, Sedimentation Control, Subchapters 4A, 4B and 4C, as amended (15 N.C.A.C. 4A, 4B and 4C). The Owner makes no representation as to the type and intensity of rainfall or storms that shall occur during the life of the Project. Southeastern North Carolina is in an area susceptible to hurricanes, severe rainfall, and storm events; these events are not uncommon to the area. No additional compensation shall be made for compliance with the Sedimentation Pollution Control Act of 1973 and NCDENR permits due to severe rainfall and storm events.

B. Upon receipt of notice that a land-disturbing activity is in violation of said act, the Contractor(s) shall be responsible for ensuring that all steps or actions necessary to bring the Project in compliance with said act are promptly taken.

C. The Contractor(s) shall be responsible for defending any legal actions instituted pursuant to NCGS 113A-64 against any party or persons described in this article.

D. To the fullest extent permitted by law and without limiting any other indemnity obligation set forth herein, the Contractor(s) shall indemnify and hold harmless the Owner, the Designer and the agents, consultants and employees of the Owner and Designer, from and against all claims, damages, civil penalties, losses and expenses, including, but not limited to, attorneys' fees, arising out of or resulting from the performance of Work or failure of performance of Work, provided that any such claim, damage, civil penalty, loss or expense is attributable to a violation of the Sedimentation Pollution Control Act. Such obligation shall not be construed to negate, abridge or otherwise reduced any other right or obligation of indemnity which would otherwise exist as to any party or persons described in this article. Any claim, damage, civil penalty, loss or expense levied on or incurred by the Owner may be paid in a timely manner by the Owner and deducted from the monies owed to the Contractor(s).

E. The Contractor shall comply with the following requirements:

1. Equipment utilized during the construction activity on a Site must be operated and maintained in such a manner as to prevent the potential or actual pollution of the surface or ground waters of the state. Fuels, lubricants, coolants, and hydraulic fluids, or any other petroleum products, shall not be discharged on to the ground or into surface waters. Spent fluids shall be disposed of in a manner so as not to enter the waters, surface or ground, of the state and in accordance with applicable state and federal disposal regulations. Any spilled fluids shall be cleaned up to the extent practicable and disposed of in a manner so as not to allow their entry into the waters, surface of ground, of the state.

2. Herbicide, pesticide, and fertilizer usage during the construction activity shall be restricted to those materials approved by EPA and shall be in accordance with label restrictions.

3. All wastes composed of building materials shall be disposed of in accordance with North Carolina General Statutes, Chapter 130A, Article 9 - Solid Waste Management, and rules governing the disposal of solid waste (North Carolina Administrative Code Section 15A NCAC 13B).

4. All sedimentation and erosion control of facilities shall be inspected by the Contractor at least once every seven (7) calendar days and within twenty-four (24) hours after any storm event of greater that 0.1 inches of rain per twenty-four (24)-hour period or any day that has been claimed by the Contractor as a rain delay.

5. The Contractor shall submit to the Owner a written report of weekly inspections. Visible sedimentation found off the Site shall be recorded with a brief explanation as to the measures taken to prevent future releases as well as any measures taken to clean up the sediment that has left the Site. This record shall be made available to DENR or authorized agent upon request.

6. The Contractor shall be fully responsible for growing and maintaining a vegetative cover on all areas of the Site in accordance with DENR Land Quality requirements.

ARTICLE 29 – INSPECTION OF THE WORK

A. It is a condition of this Contract that the Work shall be subject to inspection by the Designer, Owner, designated official representatives of the Owner, and those persons required by state law to test special work for official approval. The Contractor shall therefore provide safe access to the Work at all times for such inspections.

B. All instructions to the Contractor will be made only by or through the Designer, Owner, or the Designer or Owner's designated Project representative. Observations made by official representatives of the Owner shall be conveyed to the Designer for review and coordination when the Designer is acting as the construction administrator/inspector.

C. Should any Work be covered up or concealed prior to inspection and approval by the Designer, such Work shall be uncovered or exposed for inspection, if so requested by the Designer in writing. Inspection of the Work will be made promptly upon notice from the Contractor. All cost involved in uncovering, repairing, replacing, recovering and restoring to design condition the Work that has been covered or concealed will be paid by the Contractor involved.

D. Prompt notice of all defective Work of which Owner or Designer has actual knowledge shall be given to the Contractor.

E. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any Surety for, or employee or agent of any of them.

F. The presence of the Designer, Owner, or Inspector at the Work Site shall in no way lessen the Contractor's responsibility for conformity with the Contract Documents. Should the Designer, Owner, or Inspector, prior to or during construction, fail to point out or reject materials or Work that does not conform with plans and Specifications, whether from lack of discovery or from any other reason, it shall in no way prevent later rejection or correction to the unsatisfactory materials or Work when discovered. The Contractor shall have no claim for losses suffered due to any necessary removals or repairs resulting from the unsatisfactory Work.

G. The Contractor shall notify the Inspector a minimum of twenty-four (24) hours in advance of the Contractor's intent not to work any given day, or in the event of weather conditions prohibiting execution of the Work, by 9:00 a.m. the day of the abnormal weather.

ARTICLE 30 – TESTING

A. Where special inspection or testing is required by virtue of any state laws, instructions of the Designer, Specifications or codes, the Contractor shall give written notice a minimum of forty-eight (48) hours in advance to the designated official representatives of the Owner, of the time set for such inspection or test. Such special tests or inspections will be made in the presence of the official representatives of the Owner, and it shall be the Contractor's responsibility to serve ample notice of such tests. The Contractor shall furnish the official representatives of the Owner with all certificates of inspection or approval. Work performed without proper testing may be ordered for removal and replacement at no additional cost to the Owner.

B. The Contractor shall employ and pay for the services of an independent testing firm to perform all inspections, tests, or approvals required by the Contract Documents including, but not limited to, mix designs, soil tests, compaction tests, concrete tests, foundation tests, piling testing and inspection, and all other required material tests. The Contractor shall provide the Owner with a schedule of values for all tests to be performed on the Project. The values presented shall be all-inclusive; no separate payment shall be made for labor, materials, travel, meals, lodging, etcetera. Prior to any testing being performed, the Contractor must receive written approval from the Owner approving the selected testing firm.

C. Testing shall be performed by licensed, professional personnel according to the standards referenced in the technical specifications, or in the absence thereof, according to applicable ASTM standards or other applicable industry standards. On a daily basis, personnel performing the tests shall provide the Contractor and Owner a list of all tests performed including, at a minimum, the date, time, location, temperature, Project identifier, and tester's name.

D. If a unit price line item for "Testing Allowance" is included in the proposal, the price will be adjusted in accordance with article "Unit Price Work." The established cost of Work for the unit price line item "Testing Allowance" shall be 105% of the required testing performed and billed by the independent testing firm that is documented by actual invoices submitted to the Designer from the Contractor.

E. Payment shall not be made for failing tests, tests performed in the absence of the Owner's inspector (unless prior written authorization from the Owner's inspector has

been granted), tests unable to be verified by the daily test list, or any costs incurred due to poor scheduling.

ARTICLE 31 – CONSTRUCTION SUPERVISION

A. Throughout the progress of the Work, each Contractor shall keep at the job Site, a competent superintendent or supervisory staff satisfactory to the Designer. The superintendent shall not be changed without the consent of the Designer unless said superintendent ceases to be employed by the Contractor or ceases to be competent. The superintendent shall have authority to act on behalf of the Contractor, and instructions, directions or notices given to him shall be as binding as if given to the Contractor.

B. The Contractor shall examine and study the Contract Documents and fully understand the Project design, and shall provide constant, competent, and efficient supervision to the Work. Should he discover any discrepancies of any sort in the Drawings or Specifications, he shall report them to the Designer without delay. He will not be held responsible for discrepancies in the Drawings and/or Specifications, but shall be held responsible to report them should they become known to him.

C. All Contractors shall be required to cooperate and consult with each other during the construction of the Project. Prior to installation of Work, all Contractors shall jointly prepare coordination Drawings, showing locations of various ductworks, piping, motors, pumps, and other mechanical or electrical equipment, in relation to the structure, walls and ceilings. These Drawings shall be submitted to the Designer through the Project Expediter for information only**.** Each Contractor shall lay out and execute his Work to cause the least delay to other contractors. Each Contractor shall be financially responsible for any damage to other Contractor's Work and for undue delay caused to other contractors on the Project.

D. The Contractor is required to attend monthly job Site progress conferences as directed by the Designer. Home office representatives may be required at these meetings. Contractor representatives shall have authority to act on behalf of the Contractor. These meetings shall be open to Subcontractors, material Suppliers and any others who can contribute toward maintaining required job progress. It shall be the principal purpose of these meetings, or conferences, to effect coordination, cooperation and assistance in every practical way toward the end of maintaining progress of the Project on schedule and to complete the Project within the specified Contract Time. Each Contractor shall be prepared to assess progress of the Work as required in his particular contract and to recommend remedial measures for correction of progress as may be appropriate. The Designer or his authorized representative shall be the coordinator of the conferences and shall preside as chairman.

E. The Designer shall designate a Project Expediter on Projects involving two or more prime contracts and shall designate such in the Supplementary General Conditions. **For the purposes of a single prime contract, the single prime Contractor shall be designated as the Project Expediter.** The Project Expediter shall have the following responsibilities:

1. Prepare the Project construction schedule and shall allow all prime Contractors (multi-prime contract) and Subcontractors (single-prime contract) performing general, plumbing, HVAC, and electrical work equal input into the preparation of the initial construction schedule.

2. Maintain a Project progress schedule for all contractors.

3. Give adequate notice to all contractors to ensure efficient continuity of all phases of the Work.

4. Notify the Designer of any changes in the Project schedule.

5. Recommend to the Designer whether payment to a Contractor or Subcontractor should be approved**.**

ARTICLE 32 – SCHEDULE

A. It shall be the responsibility of the Project Expediter to cooperate with and obtain from all Prime Contractors and Subcontractors on the job, their respective work activities and integrate these activities into a Project construction schedule in form of a detailed bar chart or Critical Path Method (CPM), schedule. Each prime Contractor shall provide work activities within fourteen (14) days of request by the Project Expediter. A "work activity," for scheduling purposes, shall be any component or contractual requirement of the Project requiring at least one (1) day, but not more than fourteen (14) days, to complete or fulfill**.** The Project construction schedule shall graphically show all salient features of the Work required to construct the Project from start to finish and within the allotted time established in the Contract. The time (in days) between the Contractor's early completion and contractual completion dates is part of the Project total float time; and shall be used as such, unless amended by a Change Order**.** On a multi-prime Project, each prime Contractor shall review the proposed construction schedule and approve same in writing**.** The Project Expediter shall submit the proposed construction schedule to the Designer for comments. The complete Project construction schedule shall be of the type set forth in the Supplementary General Conditions or Subparagraph (a) or (b) below, as appropriate:

   1. For a Project with total contracts of $500,000 or less, a bar chart schedule will satisfy the above requirement. The schedule shall indicate the estimated starting and completion dates for each major element of the Work, as well as **cost values** associated with each element.

   2. For a Project with total contracts over $500,000, a Critical Path Method (CPM) schedule shall be utilized to control the planning and scheduling of the Work. The CPM schedule shall be the responsibility of the Project Expediter and shall be paid for by the Project Expediter.

B. **Bar Chart Schedule**: Where a bar chart schedule is required, it shall be time-scaled in weekly increments, shall indicate the estimated starting and completion dates for each major element of the Work by trade and by area, level, or zone, and shall schedule dates for all salient features, including but not limited to the placing of orders for materials, submittal of Shop Drawings and other Submittals for approval, approval of Shop Drawings by Designers, the manufacture and delivery of material, the testing and the installation of materials, supplies and equipment, and all Work

activities to be performed by the Contractor. The Contractor shall allow sufficient time in his schedule for all required inspections, reviews (punch lists), and correction of punch list items. Each Work activity will be assigned a time estimate by the Contractor. One day shall be the smallest time unit used.

C. **CPM Schedule**: Where a CPM schedule is required, it shall be in time-scaled precedence format using the Project Expediter's logic and time estimates. The CPM schedule shall be drawn or plotted with activities grouped or zoned by Work area or subcontract as opposed to a random (or scattered) format. The CPM schedule shall be time-scaled on a weekly basis and shall be drawn or plotted at a level of detail and logic which will schedule all salient features of the Work to be performed by the Contractor including but not limited to the placing of orders for materials, submittal of Shop Drawings and other Submittals for approval, approval of Shop Drawings by Designers, the manufacture and delivery of material, and the testing and the installation of materials, supplies and equipment. The Contractor shall allow sufficient time in his schedule for all required inspections, reviews (punch lists), and correction of punch list items. Each Work activity will be assigned a time estimate by the Contractor. One day shall be the smallest time unit used.

D. The CPM schedule will identify and describe each activity, state the duration of each activity, the calendar dates for the early and late start and the early and late finish of each activity, and clearly highlight all activities on the critical path. "Total float" and "free float" shall be indicated for all activities. Float time shall be considered for the exclusive use or benefit of the Owner. Extensions to the Contract Time, when granted by Change Order, will be granted only when equitable time adjustment exceeds the Total Float in the activity or path of activities affected by the change. Extensions to the Contract Time shall only be granted for activities on the critical path. **The CPM schedule shall also show what part of the Contract Price is attributable to each activity on the schedule, the sum of which for all activities shall equal the total Contract Price.**

E. **Early Completion of Project**: The Contractor may attempt to complete the Project prior to the Contract Completion Date. However, such planned early completion shall be for the Contractor's convenience only and shall not create any additional rights of the Contractor or obligations of the Owner under this Contract, nor shall it change the Time for Completion or the Contract Completion Date. The Contractor shall not be required to pay liquidated damages to the Owner because of its failure to complete by its planned earlier date. Likewise, the Owner shall not pay the Contractor any additional compensation for early completion nor will the Owner owe the Contractor any compensation should the Owner, its officers, employees, or agents cause the Contractor not to complete earlier than the date required by the Contract Documents.

F. The proposed Project construction schedule shall be presented to the Designer no later than ten (10) days after the Project start date for Projects with a total Contract Price of $500,000 or less and no later than thirty (30) days after the Project start date for Projects with a total Contract Price in excess of $500,000. No Request for Payment will be processed until this schedule is **accepted** by the Owner.

G. Acceptance of the schedule shall not impose on the Designer or Owner responsibility for the progress schedule, for sequencing, scheduling, or progress of the Work nor interfere with or relieve Contractor from Contractor's responsibility thereof.

H. The approved Project construction schedule shall be distributed to all contractors and displayed at the job Site by the Project Expediter.

I. The several contractors shall be responsible for their work activities and shall notify the Project Expediter of any necessary changes or adjustments to their work. The Project Expediter shall maintain the Project construction schedule, making monthly adjustments, updates, corrections, etc., that are necessary to finish the Project within the Contract Time, keeping all contractors and the Designer fully informed. Copy of a bar chart schedule annotated to show the current progress shall be submitted by the Contractor(s) to the Designer, along with monthly Request for Payment. For Project requiring CPM schedule, the Contractor shall submit a monthly report of the status of all activities. The bar chart schedule or monthly status report shall show the actual Work completed to date in comparison with the original Work scheduled for all activities. If any activities of the Work of several contractors are behind schedule, the Contractor must indicate in writing, what measures will be taken to bring each such activity back on schedule and to ensure that the Contract Completion Date is not exceeded. A plan of action and recovery schedule shall be developed and submitted to the Designer by the Project Expediter, when (1) the Contractor's monthly report indicates delays, that are in the opinion of the Designer or the Owner, of sufficient magnitude that the Contractor's ability to complete the Work by the scheduled completion is brought into question; (2) the updated construction schedule is thirty (30) days behind the planned or baseline schedule and no legitimate time extensions are in process; and (3) the Contractor desires to make changes in the logic (sequencing of work) or the planned duration of future activities of the CPM schedule which, in the opinion of the Designer or the Owner, are of a major nature. The plan of action, when required shall be submitted to the Owner for review within two (2) business days of the Contractor receiving the Owner's written demand. The recovery schedule, when required, shall be submitted to the Owner within five (5) calendar days of the Contractor's receiving the Owner's written demand. Failure to provide an updated construction schedule or a recovery schedule may be grounds for rejection of payment requests or withholding of funds as set forth in Article "Payments Withheld."

J. The Project Expediter shall notify each Contractor of such events or time frames that are critical to the progress of the job. Such notice shall be timely and reasonable. Should the progress be delayed due to the Work of any of the several contractors, it shall be the duty of the Project Expediter to immediately notify the Contractor(s) responsible for such delay, the Designer, the Owner and other prime Contractors. The Designer shall determine the Contractor(s) who caused the delays and notify the bonding company of the responsible Contractor(s) of the delays; and shall make a recommendation to the Owner regarding further action.

K. Designation as Project Expediter entails an additional Project control responsibility and does not alter in any way the responsibility of the Contractor so designated, or the responsibility of the other contractors involved in the Project.

ARTICLE 33 – WORKING HOURS

Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, and Contractor will not permit the performance of Work on Saturday, Sunday, or any legal holiday without Owner's written consent (which will not be unreasonably withheld) given after prior written notice to

the Designer. The regular working hours shall be established by the Owner. In lieu of a directive by the Owner, working hours shall be 7:30 a.m. until 6:00 p.m., Monday through Friday, excluding holidays.

ARTICLE 34 – SEPARATE CONTRACTS AND CONTRACTOR RELATIONSHIPS

A. Effective from January 1, 2002, NCGS Chapter 143, Article 8, was amended, to allow public contracts to be bid in single-prime, dual (single-prime and separate-prime), construction manager at risk, and alternative contracting method as approved by the State Building Commission. The Owner reserves the right to prepare separate Specifications, receive separate bids, and award separate contracts for such other major items of Work as may be in the best interest of the Owner.

B. All Contractors shall cooperate with each other in the execution of their Work, and shall plan their Work in such manner as to avoid conflicting schedules or delay of the Work. See Articles "Construction Supervision" and "Schedule."

C. If any part of Contractor's Work depends upon the Work of another Contractor, defects which may affect that Work shall be reported to the Designer in order that prompt inspection may be made and the defects corrected. Commencement of Work by a Contractor where such condition exists will constitute acceptance of the other Contractor's Work as being satisfactory in all respects to receive the Work commenced, except as to defects which may later develop. The Designer shall be the judge as to the quality of Work and shall settle all disputes on the matter between Contractors.

D. Any mechanical or electrical work such as sleeves, inserts, chases, openings, penetrations, etc., which is located in the Work of the general Contractor shall be built in by the general Contractor. The respective mechanical and electrical contractors shall set all sleeves, inserts and other devices that are to be incorporated into the structure in cooperation and under the supervision of the general Contractor. The responsibility for the exact location of such items shall be that of the mechanical and/or Electrical Contractor.

E. The Designer and the Owner shall have access to the Work at all times. The Contractor shall provide facilities for such access so the Designer may perform his functions under the Contract Documents.

F. Should a Contractor cause damage to the Work or property of another Contractor, he shall be directly responsible, and upon notice, shall promptly settle the claim or otherwise resolve the dispute.

ARTICLE 35 – SUBCONTRACTS AND SUBCONTRACTORS

A. Within thirty (30) days after award of the Contract, the Contractor shall submit to the Designer and to the Owner a list giving the names and addresses of Subcontractors and equipment and material Suppliers he proposes to use, together with the scope of their respective parts of the Work. The Contractor shall not employ any Subcontractor or other person or organization, either directly or indirectly, whether initially or as a substitute, against whom either the Designer or the Owner has an objection. The Designer shall act promptly in the approval of Subcontractors, and when approval of the list is given, no changes of Subcontractors will be permitted except for cause or reason considered justifiable by the Designer.

B. The Prime Contractor shall not allow first-tier Subcontractors to sublet any portion of the sub-contracted Work without written approval from the Designer. Circumvention of this requirement by a first-tier Subcontractor using the device of "hiring" the employees and/or "renting" the equipment of a second-tier Subcontractor shall be a violation of the Contract and shall subject the Prime Contractor to penalties associated with violation of the Contract. The Designer may require the Prime Contractor to provide behavioral, financial, relationship, ownership, and other documentation to support claims that Work is indeed being performed by an approved, first-tier Subcontractor. Unless waived by the Designer, at least 75% of the equipment utilized by a first-tier Subcontractor to perform the Work shall be owned by the first-tier Subcontractor and at least 75% of the 'Subcontractor's employees performing Work on the Project shall have been regular, continuous, full time employees of the company for at least six (6) months prior to performing Work on the Project.

C. The Designer will furnish to any Subcontractor, upon request, evidence regarding amounts of money paid to the Contractor on account of the Subcontractor's Work.

D. The Prime Contractor will furnish to the Designer, upon request, evidence regarding amounts of money paid and due to Subcontractors for their Work.

E. The Contractor is and remains fully responsible for his own acts or omissions as well as those of any Subcontractor or of any employee of either. The Contractor agrees that no contractual relationship exists between the Subcontractor and the Owner in regard to the Contract, and that the Subcontractor acts on this Work as an agent or employee of the Contractor.

F. The Owner reserves the right to limit the amount of portions of Work to be subcontracted. Pipe installation using trenchless technology (Horizontal Directional Drill, Bore & Jack, etc.) must be performed by the Prime Contractor or first-tier Subcontractor using their own equipment and permanent, full-time employees.

ARTICLE 36 – CONTRACTOR AND SUBCONTRACTOR RELATIONSHIPS

The Contractor agrees that the terms of these Contract Documents shall apply equally to each Subcontractor, regardless of tier, as to the Contractor, and the Contractor agrees to take such action as may be necessary to bind each Subcontractor to these terms. The Contractor further agrees to conform to the Code of Ethical Conduct as adopted by the Associated General Contractors of America, Inc., with respect to Contractor-Subcontractor relationships, and that payments to Subcontractors shall be made in accordance with the provisions of NCGS 143-134.1 titled *Interest on final payments due to prime Contractors: payments to Subcontractors*.

A. The balance due prime Contractors shall be paid in full within forty-five (45) days after respective prime contracts of the Project have been accepted by the Owner, certified by the architect, Engineer or Designer to be completed in accordance with terms of the plans and Specifications, or occupied by the Owner and used for the purpose for which the Project was constructed, whichever occurs first. Provided, however, that whenever the architect or consulting Designer in charge of the Project determines that delay in completion of the Project in accordance with terms of the plans and Specifications is the fault of the Contractor, the Project may be occupied and used for the purposes for which it was constructed without payment of any

interest on amounts withheld past the forty -five (45) day limit. No payment shall be delayed because of the failure of another prime Contractor on such Project to complete his contract. Should final payment to any prime Contractor beyond the date such contracts have been certified to be completed by the Designer or architect, accepted by the Owner, or occupied by the Owner and used for the purposes for which the Project was constructed, be delayed by more than forty-five (45) days, said prime Contractor shall be paid interest, beginning on the 46th day, at the rate of one percent (1%) per month or fraction thereof unless a lower rate is agreed upon on such unpaid balance as may be due. In addition to the above final payment provisions, periodic payments due a prime Contractor during construction shall be paid in accordance with the payment provisions of the Contract Documents or said prime Contractor shall be paid interest on any such unpaid amount at the rate stipulated above for delayed final payments. Such interest shall begin on the date the payment is due and continue until the date on which payment is made. Such due date may be established by the terms of the Contract. Where a conditional acceptance of a Contract exists, and where the Owner is retaining a reasonable sum pending correction of such conditions, interest on such reasonable sum shall not apply.

B. Within seven (7) days of receipt by the prime Contractor of each periodic or final payment, the prime Contractor shall pay the Subcontractor based on Work completed or service provided under the subcontract. Should any periodic or final payment to the Subcontractor be delayed by more than seven (7) days after receipt of periodic or final payment by the prime Contractor, the prime Contractor shall pay the Subcontractor interest, beginning on the eighth day, at the rate of one percent (1%) per month or fraction thereof on such unpaid balance as may be due.

C. The percentage of retainage on payments made by the prime Contractor to the Subcontractor shall not exceed the percentage of retainage on payments made by the Owner to the prime Contractor. Any percentage of retainage on payments made by the prime Contractor to the Subcontractor that exceeds the percentage of retainage on payments made by the Owner to the prime Contractor shall be subject to interest to be paid by the prime Contractor to the Subcontractor at the rate of one percent (1%) per month or fraction thereof.

D. Nothing in this section shall prevent the prime Contractor at the time of application and certification to the Owner from withholding application and certification to the Owner for payment to the Subcontractor for unsatisfactory job progress; defective construction not remedied; disputed Work; third-party claims filed or reasonable evidence that claim will be filed; failure of Subcontractor to make timely payments for labor, equipment and materials; damage to prime Contractor or another Subcontractor; reasonable evidence that subcontract cannot be completed for the unpaid balance of the subcontract sum; or a reasonable amount for retainage not to exceed the initial percentage retained by Owner.

ARTICLE 37 – DESIGNER'S STATUS

A. The Designer shall provide general administration of the performance of construction contracts, including liaison and necessary inspection of the Work to ensure compliance with plans and Specifications. He is the agent of the Owner only for the purpose of constructing this Work and to the extent stipulated in the Contract Documents. He has authority to stop Work or to order Work removed, or to order corrections of faulty Work where such action may be necessary to assure successful completion of the Work.

B. The Designer, when employed in a construction inspection/administration role, is the impartial interpreter of the Contract Documents, and, as such, he shall exercise his powers under the Contract to enforce faithful performance by both the Owner and the Contractor. The Designer shall issue written clarifications or interpretations of the requirements of the Contract Documents with reasonable promptness. The Designer may authorize minor variations in the Work that are different from the requirements of the Contract Documents which do not involve an adjustment of Contract Price or Time of Completion as long as such variation is compatible with the design concept of the Project.

C. The Designer will make periodic inspections of the Project at intervals appropriate to the stage of construction. He will inspect the progress, the quality and the quantity of the Work. The Designer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work.

D. The Designer and the Owner shall have access to the Work whenever it is in preparation and progress. The Contractor shall provide facilities for such access so the Designer may perform his functions under the Contract Documents.

E. Based on the Designer's inspections and evaluations of the Project, the Designer shall issue interpretations, directives and decisions as may be necessary to administer the Project. His decisions relating to artistic effect and technical matters shall be final, provided such decisions are within the limitations of the Contract.

F. The Designer will determine the actual quantities and classifications of unit price Work performed by the Contractor.

G. The Designer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

ARTICLE 38 – CHANGES IN THE WORK

A. The Owner may have changes made in the Work covered by the Contract. These changes will not invalidate and will not relieve or release the Contractor from any guarantee given by him pertinent to the Contract provisions. These changes will not affect the validity of the guarantee bond and will not relieve the Surety or Sureties of said bond. All extra Work shall be executed under conditions of the original Contract.

B. Except in an emergency endangering life or property, **NO CHANGE SHALL BE MADE BY THE CONTRACTOR EXCEPT UPON RECEIPT OF APPROVED CHANGE ORDER OR WRITTEN WORK CHANGE DIRECTIVE FROM THE DESIGNER, COUNTERSIGNED BY THE OWNER AUTHORIZING SUCH CHANGE. NO CLAIM FOR ADJUSTMENTS OF THE CONTRACT PRICE SHALL BE VALID UNLESS THIS PROCEDURE IS FOLLOWED.**

A WORK CHANGE DIRECTIVE, TRANSMITTED BY FAX OR HAND DELIVERED, MAY BE USED WHERE THE CHANGE INVOLVED IMPACTS THE CRITICAL PATH OF THE WORK. A FORMAL CHANGE

ORDER SHALL BE ISSUED WITHIN THE TIME STATED ON THE WORK CHANGE DIRECTIVE.

In the event of emergency endangering life or property, the Contractor may be directed to proceed on a time and material basis whereupon the Contractor shall proceed and keep accurately on such form as may be required, a correct account of costs together with all proper invoices, payrolls and supporting data. Upon completion of the Work the Change Order will be prepared as outlined under either Method "C 1." or Method "C 2." or both.

C. In determining the values of changes, either additive or deductive, Contractors are restricted to the use of the following methods:

1. Where the extra Work involved is covered by unit prices quoted in the proposal, the value of the change shall be computed by application of unit prices based on quantities, estimated or actual as agreed of the items involved. Unit prices shall include all direct and indirect present or future cost, all time and all overhead and profit for each unit.

2. The contracting parties shall negotiate and agree upon the equitable value of the change prior to issuance of the Change Order, and the Change Order shall stipulate the corresponding lump sum adjustment to the Contract Price.

D. Under Paragraph (B) and Methods (C 2.) above, the allowances for overhead and profit combined shall not exceed twenty percent (20%) of **net cost**. Under Method "C 1." no additional allowances shall be made for overhead and profit. In the case of deductible Change Orders, under Method (C 2.) and Paragraph (B) above, the Contractor shall include no less than five percent (5%) profit, but no allowances for overhead. Overhead shall include all conditions of the Contract, "Extended General Conditions", and all general requirements including, but not limited to, Project management, scheduling, home office expense, job Site overhead, layout, reproduction of Drawings, document processing and coordination (shop Drawings, Change Orders, RFI"s, etc.), supervision, small tools, temporary facilities, safety provisions, as built Drawings, estimating, and general overhead.

E. The term "net cost" as used herein shall mean the difference between all proper cost additions and deductions. The "cost" as used herein shall be limited to the following:

1. The actual costs of materials and supplies incorporated or consumed as part of the Project.

2. The actual costs of labor expended on the Project Site.

3. The actual costs of labor burden, limited to the costs of social security (FICA) and Medicare/Medicaid taxes; unemployment insurance costs; health/dental/vision insurance premiums; paid employee leave for holidays, vacation, sick leave, and/or petty leave, not to exceed a total of thirty (30) days per year; retirement contributions; worker's compensation insurance premiums; and the costs of general liability insurance when premiums are computed based on payroll amounts. The total labor burden shall not exceed forty percent (40%) of the actual costs of labor.

4. The actual costs of rental for equipment; machinery; temporary facilities; and tools, excluding hand tools, required for the Project.

5. The actual costs of premiums for bonds, insurance, permit fees, and sales or use taxes related to the Project.

6. Overtime and extra pay for holidays and weekends may be a cost item only to the extent approved by the Owner.

F. Should concealed conditions be encountered in the performance of the Work below grade, or should concealed or unknown conditions in an existing structure be at variance with the conditions indicated by the Contract Documents, the Contract sum and time for completion may be equitably adjusted by Change Order upon claim by either party made within thirty (30) days after the condition has been identified. The cost of such change shall be arrived at by one of the foregoing methods.

ALL CHANGE ORDERS SHALL BE SUPPORTED BY A BREAKDOWN SHOWING METHOD OF ARRIVING AT NET COST AS DEFINED ABOVE.

G. The Contractor may solicit a change using the "Change Proposal" form or may submit a "Change Proposal" form when the Designer requests costs for potential changes in the Work. However, no Work is to be performed until a properly executed Change Order or Work Change Directive is provided to the Contractor. The Contractor shall provide the "Change Proposal" and supporting data in a form suitable to the Designer and Owner. The Designer shall verify correctness. Within fourteen (14) days after receipt of the "Change Proposal," the Designer shall respond, in writing, to the Contractor's proposal. If the Designer deems that the Proposal is in the best interest of the Owner, the Designer shall prepare a Change Order or Work Change Directive and forward to the Contractor for his signature. Within seven (7) days after receipt of the Change Order or Work Change Directive executed by the Contractor, the Designer shall certify the document by his signature, and forward the document and all supporting data to the Owner for the Owner's signature. The Owner's representative shall execute the document and, if necessary, forward to the County Commissioners for final approval. Upon approval by the Owner's representative and County Commissioners, one copy remains with the County Commissioners, and the remaining original is sent to the Designer for distribution to the Contractor(s). A copy is sent to the Surety. In case of emergency or extenuating circumstances, approval of changes may be obtained verbally by telephone or Work Change Directives approved by all parties, then shall be substantiated in writing as outlined under normal procedure.

H. At the time of signing a Change Order, the Contractor shall be required to certify as follows:

> "I certify that my bonding company will be notified forthwith that my Contract has been changed by the amount of this Change Order, and that a copy of the approved Change Order will be mailed upon receipt by me to my Surety."

I. A Change Order, when issued, shall be full compensation, or credit, for the Work included, omitted or substituted. It shall show on its face the adjustment in time for completion of the Project as a result of the change in the Work.

J. If, during the progress of the Work, the Owner requests a Change Order and the Contractor's terms are unacceptable, the Owner may require the Contractor to perform such Work on a time and material basis in accordance with Paragraph (B)

above. Without prejudice, nothing in this paragraph shall preclude the Owner from performing or to have performed that portion of the Work requested in the Change Order.

K. If a unit price line item for "Change Order Allowance" or similar is included in the proposal, the price will be adjusted in accordance with article "Unit Price Work." The established cost of Work for the unit price line item "Change Order Allowance" shall be one hundred percent (100%) of approved Change Orders, either additive or deductive.

ARTICLE 39 – UNIT PRICE WORK

A. The Project is "lump sum" and payment of the lump sum bid price shall be full compensation for all Work indicated in the Contract Documents. Unit Price items included in the proposal shall be included as part of the lump sum bid. These items are indicated in the proposal and may have an associated quantity. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item. When indicated, the estimated quantities of items of unit price Work are not guaranteed and are solely for the purpose of comparison of bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of unit price Work included in the lump sum bid that is performed by the Contractor will be made by the Designer. The Designer shall issue a Change Order, either additive or deductive, at the close of the Project for any variation between the actual quantity and the estimated quantities of the unit price Work indicated in the Contract Documents. No payment shall be made to the Contractor for re-stocking of materials.

B. The quantities shown on the proposal form are for the base bid only unless the Contract Documents specifically indicate that the item(s), or any portion thereof, are part of an alternate bid element. It is the responsibility of the Contractor to apportion the cost of unit price items to the base bid and any alternates listed in the Proposal using information in the Contract Documents. In the event that the Owner selects an alternate that clearly increases or decreases the estimated quantity of a unit price item shown on the proposal form, after selection of the Contractor, the Contractor shall be provided an updated list of estimated unit price quantities reflective of the alternates chosen. This updated list shall be used in determining any variation between the actual quantities and the estimated quantities of the unit price Work. An estimated unit price quantity shall be updated only in the event that the Contract Documents clearly indicate that the unit price item was indeed part of the Owner-selected alternate. The cost for all unit price items shall be included within either the base bid or an alternate, as applicable.

C. In situations where a particular unit price item overruns, or the Contractor expects such overrun, of an estimated quantity by more than twenty-five percent (25%), the Contractor shall notify the Designer in writing and shall not install the overrun item in excess of twenty-five percent (25%) until the Contractor has received written authorization from the Designer. The aforesaid notification from the Contractor shall include any requests for modification of the unit price due to an actual quantity overrun greater than twenty-five percent (25%). The Engineer may solicit a reduction in the unit price due to a sufficient increase in the actual quantity installed of a unit price item. A reduction, regardless of the amount, of the actual installed quantity of a unit price item shall not warrant a change in the unit price.

D. The Contractor is responsible for maintaining all documentation pertaining to the actual quantities of unit price items. This will be remitted to the Designer upon request. No payment shall be made for the quantity of unit price items that cannot be verified.

E. There will be no measurement for lump sum bid items by this Contract, as payment of the lump sum price shall include all equipment, labor, materials, and incidentals necessary to perform the Work required.

F. Extensions to the Contract Time shall not entitle the Contractor to an increase to any unit price.

ARTICLE 40 – ALLOWANCE ITEMS

The Contract Price includes the allowance items indicated on the bid proposal. Allowances cover the costs for portions of the Work that cannot be specified with sufficient particularity at the time of bid. The Contractor shall provide product recommendations and associated costs to the Owner for allowance items, but shall not incorporate into the Work without consent from the Owner. The allowance items may be utilized and specified by the Owner in its sole and absolute discretion within a reasonable time prior to the date on which the Contractor shall be required to utilize such items. The amount shown for each allowance item shall include, and may be used by the Owner for, the cost of the material, equipment, or service for the allowance item. All other costs associated with installing an allowance item, including without limitation the cost of all labor, overhead, and profit, are otherwise included in the Contract Price and shall not be paid for with the amount allocated to each allowance item. The sole exception being additive Changes in the Work approved and designated by the Owner to be paid for out of a "Change Order Allowance"; the value of such Changes in the Work shall be determined according to the Article "Changes in the Work" section C. 2. The amount paid to the Contractor for an allowance item shall be adjusted based on the actual value attributable to the particular allowance item. The Designer shall issue a Change Order, either additive or deductive, at the close of the Project for any variation between the actual value of an allowance item and the estimated value of the allowance item shown on the Form of Proposal. If an allowance item is not utilized by the Owner, the Contract Price shall be reduced by the amount allocated to the item and a reasonable amount for the unused labor and overhead and unearned profit associated therewith. Allowance items designated on the bid proposal may or may not be indicated on the Project plans or Specifications.

ARTICLE 41 – CLAIMS FOR EXTRA COST

A. Should the Contractor consider that as a result of any instructions given in any form by the Designer, he is entitled to extra cost above that stated in the Contract, he shall give written notice thereof to the Designer within seven (7) days without delay, and shall not proceed with the Work affected until further advised, except in emergency involving the safety of life or property, which condition is covered in Article "Changes in the Work," Paragraph (B) and Articles "Protection of Work and Property" and "Safety." No claims for extra compensation will be considered unless the claim is so made. The Designer shall render a written decision within seven (7) days of receipt of claim.

B. **THE CONTRACTOR SHALL NOT ACT ON INSTRUCTIONS RECEIVED BY HIM FROM PERSONS OTHER THAN THE DESIGNER, AND ANY CLAIMS FOR EXTRA COMPENSATION OR EXTENSION OF TIME ON**

ACCOUNT OF SUCH INSTRUCTION WILL NOT BE HONORED. The Designer will not be responsible for misunderstandings claimed by the Contractor of verbal instructions which have not been confirmed in writing, and in no case shall instructions be interpreted as permitting a departure from the Contract Documents unless such instruction is confirmed in writing and supported by a properly authorized Change Order.

C. Should a claim for extra compensation by the Contractor be denied by the Designer or Owner, and cannot be resolved by the County Commissioners, the Contractor may request mediation in accordance with the procedures set forth below. If the Contractor is unable to resolve its claim as a result of mediation, the Contractor may institute a civil action for the sum he claims to be entitled to under the Contract by filing a verified complaint and the issuance of a summons in the Superior Court of Brunswick County. The procedure shall be the same as in all civil actions except that all issues shall be tried by a judge, without a jury.

ARTICLE 42 – DISPUTE RESOLUTION

A. Initiating Mediated Settlement Conferences

1. A party to a dispute arising out of the Contract and the construction process in which the amount in controversy is at least $15,000 may submit a written request to the County for mediation of the dispute.

2. Prior to submission of a written request for mediation to the County, the party requesting mediation should give notice of any and all claims in accordance with their respective contracts, obtain decisions on the claims as required or allowed by their respective contracts, and attempt to resolve the dispute according to the terms and conditions in their respective contracts. The Mediator may adjourn any mediated settlement conference if the Mediator believes, in his or her sole discretion, that the parties have not satisfied all of the terms and conditions of their respective contracts and that doing so will enhance the prospects for a negotiated settlement.

3. Condition Precedent to Litigation. Before any party to a Contract may commence a civil action against the County seeking remedies for breach or non-performance of the Contract by the County, said party must first initiate the dispute resolution process as provided for herein and attend and participate in good faith in the mediated settlement conference.

B. Selection of a Mediator

1. Unless otherwise agreed upon in writing, the parties shall mutually select an attorney certified to conduct superior court mediations by the North Carolina Dispute Resolution Commission. If the Mediator selected is not available or declines to participate for any reason, the parties shall select another person from the list.

2. Disqualification of Mediator. Any party may request replacement of the Mediator for good cause. Nothing in this provision shall preclude Mediators from disqualifying themselves.

C. The Mediated Settlement Conference

1. Where Conference is to be Held. The mediated settlement conference shall be held in Brunswick County, North Carolina. The Mediator shall be responsible for reserving a location, making arrangements for the conference, and giving timely notice of the time and location of the conference to all attorneys, unrepresented parties and other persons or entities required to attend.

2. When Conference is to be Held. The mediation shall be completed within sixty (60) days after selection of the Mediator unless all parties to the mediation agree to a different schedule.

3. Request to Accelerate or Extend Deadline for Completion. Any party or the Mediator may request the County to accelerate or extend the deadline for completion of the conference. Such request shall state the reasons the acceleration or extension is sought and shall be served by the moving party upon the other parties and the Mediator. Objections to the request must be promptly communicated to the County and to the Mediator. The County, with the concurrence of the designated Mediator, may grant the request by adjusting the time for completion of the conference.

4. Recesses. The Mediator may recess the mediation conference at any time and may set times for reconvening. If the Mediator determines the time and place where the conference is to reconvene before the conference is recessed, no further notice is required to persons present at the conference.

5. Project Delay. The mediated settlement conference that results from a construction contract dispute shall not be cause for the delay of the construction project.

D. Duties of Parties and other Participants in Formal Dispute Resolution Process

1. Attendance.

   a. All parties to the dispute must designate an official representative to attend the mediation.

   b. Attorneys representing parties may attend the mediation, but are not required to do so.

   c. Sureties and insurance company representatives are required to physically attend the mediation unless the Mediator and all of the other parties to the mediation excuse their attendance or consent to their attendance by telephone or other electronic means.

   d. The parties who attend a duly scheduled mediation conference shall have the right to recover their share of the Mediator's compensation from any party or parties who fail to attend the conference without good cause.

2. Finalizing Agreement. If an agreement is reached in the conference, the terms of the agreement shall be confirmed in writing and signed by all parties.

3. Payment of Mediation Fee: Mediation Fees shall be divided between the parties to the dispute, with at least one-third of the total cost to be paid by County.

4. Failure to Compensate Mediator. Any party's failure to compensate the Mediators in accordance with NCGS § 143-128(f1) shall subject that party to a withholding by the County of said amount of money from the party's payment or any other moneys owed by that party to the County.

E. Authority and Duties of the Mediator

1. Authority of Mediator.

a. Control of Conference. The Mediator shall at all times be in control of the conference and the procedures to be followed.

b. Private Consultation. The Mediator may communicate privately with any participant or counsel prior to and during the conference. The fact that private communications have occurred with a participant shall be disclosed to all other participants at the beginning of the conference.

c. Scheduling the Conference. The Mediator shall make a good faith effort to schedule the conference at a time that is convenient with the participants, attorneys and Mediator. In the absence of agreement, the Mediator shall select the date for the conference.

d. Determining good cause for a party's failure to appear at a scheduled mediation conference.

e. Duties of Mediator.

i. The Mediator shall define and describe the following at the beginning of the conference:

ii. The process of mediation.

iii. The difference between mediation and other forms of conflict resolution.

iv. The costs of the mediated settlement conference.

v. That the mediated settlement conference is not a trial, the Mediator is not a judge, and the parties retain their legal rights if they do not reach settlement; however, the Mediator will advise all parties that failure to appear at mediation without good cause may result in imposition of sanctions and may be asserted as a bar to lawsuits by claimants who have failed to exhaust this administrative remedy.

vi. The circumstances under which the Mediator may meet and communicate privately with any of the parties or with any other person.

vii. Whether and under what conditions communications with the Mediator will be held in confidence during the conference.

viii. The inadmissibility of conduct and statements as provided by NCGS §7A-38.1(1).

ix. The duties and responsibilities of the Mediator and the participants.

x. That any agreement reached will be reached by mutual consent.

f. Disclosure. The Mediator has a duty to be impartial and to advise all participants of any possible bias, prejudice or partiality.

g. Declaring Impasse. The Mediator may determine at any time during the mediation conference that an impasse exists and that the conference should end.

h. Reporting Results of Conference. The Mediator shall submit a written report to the County and the other parties within ten (10) days of the conference stating whether or not the parties reached an agreement. The Mediator's report shall indicate the absence of any party from the mediated settlement conference without permission or good cause.

i. Scheduling and Holding the Conference. It is the duty of the Mediator to schedule the conference and conduct it prior to the deadline of completion set by the rules. The Mediator shall strictly observe deadlines for completion of the conference unless said time limit is changed by agreement of the parties.

F. Amendments

The dispute resolution procedures may be amended by the County at any time. Amendments will not affect mediations where claims and/or requests for mediation have been filed at the time the amendment takes effect.

F. Time Limits

Any time limit may be waived or extended at the sole discretion of the County, if no Mediator has been selected, and at the discretion of the County with concurrence of the Mediator if a Mediator has been selected.

ARTICLE 43 – MINOR CHANGES IN THE WORK

The Designer will have the authority to order minor changes in the Work not involving an adjustment in the Contract sum or time of completion, 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.

ARTICLE 44 – TIME OF COMPLETION, DELAYS, EXTENSION OF TIME

The time of completion is stated in the Notice to Bidders and in the Form of Construction Contract. The Project Expediter, upon Notice of Award of Contract, shall prepare a construction schedule to complete the Project within the time of completion as required by the Article "Schedule."

A. The Contractors shall commence Work to be performed under this agreement and the time of completion shall commence to run on the thirtieth day after the effective date of the Contract, or if a Notice to Proceed is given, on the date specified in a written Notice to Proceed. The Contractor shall fully complete all Work hereunder within the

time of completion stated. A Notice to Proceed may be given at any time within thirty (30) days after the effective date of the Contract.

B. No Work shall be performed until the Owner receives and accepts fully executed Contracts, performance bonds, payment bonds, and certificates of insurance.

C. For each calendar day in excess of the time of completion, the Contractor(s) shall pay the Owner the sum stated as liquidated damages (see Notice to Bidders) reasonably estimated in advance to cover the losses to be incurred by the Owner by reason of failure of said Contractor(s) to complete the Work within the time specified, such time being in the essence of this Contract and a material consideration thereof.

D. The Designer shall be the judge as to the division of responsibility between the Contractor(s), based on the construction schedule, weekly reports and job records, and shall apportion the amount of liquidated damages to be paid by each of them, according to delay caused by any or all of them.

E. If the Contractor is delayed in the progress of critical path activities by any act or negligence of the Owner or the Designer, or by any employee of either; by any separate Contractor employed by the Owner; by changes ordered in the Work; by labor disputes at the Project Site; by abnormal weather conditions not reasonably anticipated for the locality where the Work is performed; by unavoidable casualties; by any causes beyond the Contractor's control; or by any other causes which the Designer and Owner determine may justify the delay, then the Contract Time may be extended by Change Order for the time which the Designer and Owner may determine is reasonable. However, such delays **must** be on critical path activities that cause the anticipated Project construction time to exceed the Time of Completion. Extensions to the Contract Time, when granted by Change Order, will be granted only when equitable time adjustment exceeds the Total Float in the activity or path of activities affected by the change.

F. Time extensions granted for a portion of the Work shall not obligate the Owner to grant time extensions for portions of the Work not affected by the delay. The Engineer may establish an extended Time of Completion for Work affected by delays while still maintaining the overall Time of Completion for the Work not affected by delays. Liquidated Damages may be assessed for any portion of the Work not completed within any Time of Completion term set by the Engineer, though the daily Liquidated Damage rate may not exceed that indicated within the Contract Documents.

G. Time extensions will not be granted for rain, wind, snow or other natural phenomena of **normal intensity** for the locality where Work is performed. Based on National Oceanic and Atmospheric Administration (NOAA) National Weather Service records between 1971 and 2000 for weather stations in the Brunswick County area (Wilmington, NC and Myrtle Beach, SC) the average annual days for precipitation equal to or exceeding 0.1 inch is 75. This is further broken down by month as follows:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
7	6	6	5	6	7	9	8	6	4	5	6

For the purposes of determining time extensions based on weather, **normal intensity** weather conditions is defined on a monthly basis as noted in the chart above. For any given month, if the actual number of days in which precipitation exceeds 0.1 inch is greater than that listed in the chart; the Contractor may request a time extension for the difference. However, days in which the precipitation exceeds 0.1 inch but the Contractor is not mobilized to the Site or actively working on Site are excluded from the calculation. Actively working on-site is evidenced by onsite work operations the normally scheduled working day prior to and after the day of precipitation. Time extensions will not be given for days in which the precipitation is less than 0.1 inch. For the purpose of determining the extent of delay attributable to unusual weather phenomena, the Normal Intensity weather conditions shall be compared to NOAA National Weather Service data from the station nearest the Project. In the event that a Contract begins or ends in the middle of the month, the Normal Intensity days shall be prorated based on the number of Contract days within the partial month. Time extensions for weather delays do not entitle the Contractor to "extended overhead" recovery.

H. Request for extension of time shall be made in writing within thirty (30) days following cause of delay. In case of continuing cause for delay, the Contractor shall notify the Designer of the delay within thirty (30) days of the beginning of the delay and only one claim is necessary.

I. The Contractor shall notify his Surety in writing of extension of time granted.

J. No claim shall be allowed on account of failure of the Designer to furnish Drawings or instructions until twenty (20) days after demand for such Drawings and/or instructions. See Article "Shop Drawings, Submittals, Samples, Data."

K. The Contractor shall carry on the Work and adhere to the schedule during all disputes or disagreements with the Owner or Designer. No Work shall be delayed or postponed pending resolution of any disputes or disagreements unless agreed to by both the Owner and Contractor in writing.

L. In no event shall the Owner or Designer be liable to Contractor, any Subcontractor, any Supplier, or any other person or organization, or to any Surety for or employee or agent of any of them, for damages arising out of or resulting from delays within the control of the Contractor or delays beyond the control of both the Owner and Contractor, including fires, floods, epidemics, abnormal weather conditions, acts of God, or acts of neglect by utility owners or other contractors performing other Work.

M. Time extensions granted to the Contractor shall cover all Work delays for Work items that may run concurrently. For example, if the Contractor is due a time extension for unusual weather phenomena and due a time extension for other delays to a critical path activity, the new Project completion date shall be based on the longer of the individually approved time extensions. The time extension granted for multiple delays shall **not** be additive. The only exception to this is where the Contractor can demonstrate to the satisfaction of the Engineer that the individual Work items cannot run concurrently.

ARTICLE 45 – PARTIAL UTILIZATION/SUBSTANTIAL COMPLETION

A. The Owner may desire to occupy or utilize all or a portion of the Project when the Work is substantially complete on all or a portion of the Project.

B. Prior to the final payment, the Owner may request the Contractor(s) in writing, through the Designer if applicable, to permit him to use a specified part of the Project which he believes he may use without significant interference with construction of the other parts of the Project. If the Contractor(s) agree, the Designer will schedule a substantial completion inspection, with the approval of the Owner, after which the Designer may issue a certificate of substantial completion on all or a portion of the Project. The certificate shall include the following documentation:

1. Date of substantial completion.

2. Portion of Project determined to be substantially complete.

3. A tentative list of items to be completed or corrected before final payment.

C. The Owner shall have the right to exclude the Contractor from any part of the Project which the Designer has so certified to be substantially complete, but the Owner will allow the Contractor reasonable access to complete or correct Work to bring it into compliance with the Contract.

D. Occupancy by the Owner under this article will in no way relieve the Contractor from his contractual requirement to complete the Project within the specified time. The Contractor will not be relieved of liquidated damages because of use or occupancy by the Owner.

ARTICLE 46 – FINAL INSPECTION, ACCEPTANCE, AND PROJECT CLOSEOUT

A. Upon written notification from the Contractor(s) that the Project is complete and ready for inspection, the Designer shall make a preliminary final inspection to verify that the Project is complete and ready for final inspection. Prior to final inspection, the Contractor(s) shall complete all items requiring corrective measures noted at the preliminary inspection. The Designer shall schedule a final inspection at a time and date acceptable to the Owner and Contractor(s).

B. When contractors finish their Work prior to completion by other contractors, these Contracts shall be closed out through the final inspection, acceptance and final payment process on recommendation of the Designer and approval of the Owner.

C. At the final inspection, the Designer shall, if job conditions warrant, record a list of items that are found to be incomplete or not in accordance with the Contract Documents. At the conclusion of the final inspection, the Designer and Owner shall make one of the following determinations:

1. That the Project is completed and accepted. The “Date of Final Acceptance” is coincident with the date of the final inspection.

2. That the Project is complete subject to the list of discrepancies (punch list). All punch list items must be completed within thirty (30) days of acceptance or the Owner may invoke the Article “Owner’s Right to Do Work.” The “Date of Final Acceptance” shall be no earlier than the date that the Project representative certifies completion of the punch list items.

3. That the Project is not complete. The Contractor must establish another date for a final inspection when Project is deemed incomplete.

D. Within fourteen (14) days of acceptance as noted above or within fourteen (14) days after completion of punch list as noted above, the Designer shall certify the Work and issue applicable certificate(s) of compliance with the "Date of Final Acceptance" noted thereon.

E. Any discrepancies listed or discovered after the date of final inspection and acceptance as noted above shall be handled in accordance with Article "Guarantee."

F. The "Date of Final Acceptance" as indicated on the Certificate of Compliance will establish the following:

1. The beginning of guarantees and warranties period.

2. The date on which the Contractor's insurance coverage for public liability, property damage and builder's risk may be terminated.

3. That no liquidated damages (if applicable) shall be assessed after this date.

4. The termination date of utility cost to the Contractor.

G. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents.

1. Observations by Designer;

2. Recommendation by Designer or payment by Owner of any progress or final payment;

3. The issuance of a certificate of Substantial Completion or any payment related thereto by Owner;

4. Use or occupancy of the Work or any part thereof by Owner;

5. Any acceptance by Owner or any failure to do so;
6. Any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Designer;

7. Any inspection, test, or approval by others; or

8. Any correction of defective Work by Owner.

H. Acceptance of the Work, or any portion of the Work, by the Owner does not relieve the Contractor from acquiring acceptance of the Work from the North Carolina Department of Transportation or any other such regulatory agency having approval authority over any portion of the Project. Furthermore, acceptance of the Work or any portion of the Work by the North Carolina Department of Transportation or any other such regulatory agency having approval authority does not obligate the Owner to grant acceptance of the Work.

ARTICLE 47 – CORRECTION OF WORK BEFORE FINAL PAYMENT

A. Any Work, materials, fabricated items or other parts of the Work which have been condemned or declared not in accordance with the Contract by the Designer shall be promptly removed from the Work Site by the Contractor, and shall be immediately replaced by new Work in accordance with the Contract at no additional cost to the Owner. Work or property of other contractors or the Owner, damaged or destroyed by virtue of such faulty Work, shall be made good at the expense of the Contractor whose Work is faulty.

B. Correction of condemned Work described above shall commence within twenty-four (24) hours after receipt of notice from the Designer, and shall make satisfactory progress until completed.

C. Should the Contractor fail to proceed with the required corrections, then the Owner may complete the Work in accordance with the provisions of Article "Owner's Right to Do Work."

ARTICLE 48 – CORRECTION OF WORK AFTER FINAL PAYMENT

See Article "Performance Bond and Payment Bond," and Article "Guarantee." Neither the final certificate, final payment, occupancy of the premises by the Owner, nor any provision of the Contract, nor any other act or instrument of the Owner, nor the Designer, shall relieve the Contractor from responsibility for negligence, or faulty material or workmanship, or failure to comply with the Drawings and Specifications. He shall correct or make good any defects due thereto and repair any damage resulting therefrom, which may appear during the guarantee period following final acceptance of the Work except as stated otherwise under Article "Guarantee." The Owner will report any defects as they may appear to the Contractor and establish a time limit for completion of corrections by the Contractor. The Owner will be the judge as to the responsibility for correction of defects.

ARTICLE 49 – ACCEPTANCE OF DEFECTIVE WORK

If instead of requiring correction or removal and replacement of defective or faulty Work, Owner prefers to accept it, Owner may do so. Contractor shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work and the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Designer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

ARTICLE 50 – OWNER'S RIGHT TO DO WORK

A. If, during the progress of the Work or during the period of guarantee, the Contractor fails to prosecute the Work properly or to perform any provision of the Contract, the Owner, after fifteen (15) days" written notice sent by certified mail, return receipt requested, to the Contractor from the Designer, may perform or have performed that portion of the Work. If the Work is deemed to be an emergency, the Owner may dispense with the fifteen (15) days' written notice and proceed with the Work immediately. The cost of the Work may be deducted from any amounts due or to become due to the Contractor. Should the cost of such action of the Owner exceed the amount due or to become due the Contractor, then the Contractor or his Surety, or both, shall be liable for and shall pay to the Owner the amount of said excess. The Contractor shall not be allowed an extension of Time of Completion (or milestones) because of any delay in the performance of the Work attributable to the exercise by the Owner of Owner's rights and remedies.

B. In exercising the rights and remedies under this paragraph, Owner shall proceed expeditiously. In connection with such corrective and remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Designer and Designer's Consultants access to Site to enable Owner to exercise the rights and remedies under this paragraph.

C. The Owner may have other Work performed at the Site by Owner's employees, contractors, or utility owners. Contractor shall afford each other Contractor who is a party to such other Work proper and safe access to the Site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other Work and shall properly coordinate the Work with theirs.

ARTICLE 51 – TERMINATION BY OWNER AND REMEDIES

A. If the Contractor fails to begin the Work under the Contract within the time specified, or the progress of the Work is not maintained on schedule, or the Work is not completed within the time specified, or if the Contractor fails to perform the Work with sufficient workmen and equipment or with sufficient materials to ensure the prompt completion of said Work, or shall perform the Work unsuitably or shall discontinue the prosecution of the Work, or if the Contractor shall become insolvent or be declared bankrupt or commit any act of bankruptcy or insolvency, or allow any final judgment to stand against him unsatisfied for a period of forty-eight (48) hours, or shall make an assignment for the benefit of creditors, or disregards laws, regulations, or direction of the Designer, or for any other cause whatsoever shall not carry on the Work in an acceptable manner, the Owner may give notice in writing, sent by certified mail, return receipt requested, to the Contractor and his Surety of such delay, neglect or default, specifying the same, and if the Contractor within a period of fifteen (15) days after such notice shall not proceed in accordance therewith, then the Owner shall declare this Contract in default, and, thereupon, the Surety shall promptly take over the Work and complete the performance of this Contract in the manner and within the time frame specified. In the event the Surety shall fail to take over the Work to be done under this Contract within fifteen (15) days after being so

notified and notify the Owner in writing, sent by certified mail, return receipt requested, that he is taking the same over and stating that he will diligently pursue and complete the same, the Owner shall have full power and authority, without violating the Contract, to take the prosecution of the Work out of the hands of said Contractor, to appropriate or use any or all Contract materials and equipment on the grounds as may be suitable and acceptable and may enter into an agreement, either by public letting or negotiation, for the completion of said Contract according to the terms and provisions thereof or use such other methods as in his opinion shall be required for the completion of said Contract in an acceptable manner. All costs and charges incurred by the Owner, together with the costs of completing the Work under Contract, shall be deducted from any monies due or which may become due said Contractor and Surety. In case the expense so incurred by the Owner shall be less than the sum which would have been payable under the Contract, if it had been completed by said Contractor, then the said Contractor and Surety shall be entitled to receive the difference, but in case such expense shall exceed the sum which would have been payable under the Contract, then the Contractor and the Surety shall be liable and shall pay to the Owner the amount of said excess.

B. Upon fifteen (15) days" written notice to Contractor and Designer, Owner may, without cause and without prejudice to any other right or remedy of Owner, elect to terminate the Contract. In such case, Contractor shall be paid (without duplication of any items):

1. For completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. For expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and

3. For reasonable expenses directly attributable to termination.

C. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

ARTICLE 52 – CONTRACTOR'S RIGHT TO STOP WORK OR TERMINATE THE CONTRACT

A. Should the Work be stopped by order of a court having jurisdiction, or by order of any other public authority for a period of three (3) months, due to cause beyond the fault or control of the Contractor, or if the Owner, without cause, should fail or refuse to make payment based on a Request for Payment approved by the Designer within forty-five (45) days after receipt of same, then the Contractor, after fifteen (15) days" written notice sent by certified mail, return receipt requested, to the Owner and the Designer, may suspend operations on the Work or terminate the Contract.

B. In the event that the Contract is terminated due to cause beyond the fault or control of the Contractor, the Owner shall be liable to the Contractor for the cost of all materials delivered and Work performed on this Contract as determined according to the Article "Changes in the Work". The Designer shall determine the correctness of such payment.

ARTICLE 53 – REQUESTS FOR PAYMENT

A. Not later than the fifth day of the month, the Contractor shall submit to the Designer a Request for Payment for Work done during the previous month. The request shall be in the form "Request for Payment" in the Contract Documents and shall show substantially the value of Work done and materials delivered to the Site during the period since the last payment, and shall sum up the financial status of the Contract with the following information:

1. Total of Contract including approved Change Orders.

2. Value of Work completed to date and properly stored on-site materials.

3. Less five percent (5%) retainage, provided however, that after fifty percent (50%) of the Contractor's Work has been satisfactorily completed on schedule, with written consent of the Surety, the Owner shall not require any additional retainage. If the Owner determines the Contractor's performance is unsatisfactory, the Owner may reinstate retainage for each subsequent payment. There shall be no retainage on contracts with a bid amount less than $100,000.

4. Less previous payments.

5. Current amount due.

B. The Contractor, upon request of the Designer, shall substantiate the request with invoices of vouchers or payrolls or other evidence.

C. The Contractor shall submit a fully completed "Periodic Payment Itemized Tax Statement" and "Periodic Payment Tax Certification" form with each Request for Payment.

D. Prior to submitting the first request, the Contractor shall prepare for the Designer a schedule showing a breakdown of the Contract Price into values of the various parts of the Work, so arranged as to facilitate payments to Subcontractors in accordance with Article "Contractor and Subcontractor Relationships." The Contractor(s) shall list the value of each Subcontractor and Supplier, identifying each minority business Subcontractor and Supplier as listed in Affidavit C, if applicable.

E. Payment for Mobilization in excess of 3% of the initial Contract value shall be made with the Final Payment.

F. Twenty percent (20%) of the payment for installed underground piping may be withheld until the installed piping has passed all necessary testing requirements and the required vegetative cover has been established, or at the discretion of the Owner, seeding and mulching has been performed. A separate line item for "Testing and Vegetative Cover over Piping" may be shown on the schedule that reflects a cost of at least 25% of the underground piping cost.

G. When payment is made on account of stored materials and equipment, such materials must be stored on the Owner's property, and the requests for payments shall be accompanied by invoices or bills of sale or other evidence to establish the Owner's title to such materials and equipment. Responsibility for such stored materials and equipment shall remain with the Contractor regardless of ownership title. Such stored

materials and equipment shall not be removed from the Owner's property. Should the space for storage on-site be limited, the Contractor, at his option, shall be permitted to store such materials and/or equipment in a suitable space off-site. Should the Contractor desire to include any such materials or equipment in his Request for Payment, they must be stored in the name of the Owner in a commercial warehouse approved by the Designer and the Owner and located as close to the Site as possible. The warehouse selected must be approved by the Contractor's bonding and insurance companies; the material to be paid for shall be assigned to the Owner and shall be inspected by the Designer. Upon approval by the Designer of the storage facilities and materials and equipment, payment therefore will be certified. Responsibility for such stored materials and equipment shall remain with the Contractor. Such stored materials and equipment shall not be moved except for transportation to the Project Site. Under certain conditions, the Designer may approve storage of materials at the point of manufacture, which conditions shall be approved by the Designer and the Owner prior to approval for the storage and shall include an agreement by the storing party which unconditionally gives the Owner absolute right to possession of the materials at any time. Bond, security and insurance protection shall continue to be the responsibility of the Contractor(s).

H. Along with each Request for Payment, the Contractor shall submit evidence to the Designer showing that all record Drawings are up to date.

I. Along with each Request for Payment, the Contractor shall submit either a statement indicating that no claims for extension of time due to weather is to be made during the billing period OR shall make claims for extension of time for the billing period in accordance with the article "Time of Completion, Delays, Extension of Time."

ARTICLE 54 – APPROVAL OF PAYMENTS AND FINAL PAYMENT

A. Within ten (10) days from receipt of Request for Payment from the Contractor, the Designer shall issue and forward to the Owner the approved Request for Payment. This Request for Payment shall indicate the amount requested or as approved by the Designer. If the request is not approved by the Designer, he shall state in writing to the Contractor and the Owner his reasons for withholding payment. In the latter case, the Contractor may make the necessary corrections and resubmit the Request for Payment.

B. No approval of a Request for Payment or payment made shall constitute an acceptance of the Work or any part thereof. The making and acceptance of final payment shall constitute a waiver of all claims by the Owner except:

1. Claims arising from unsettled liens or claims against the Contractor.

2. Faulty Work or materials appearing after final payment.

3. Failure of the Contractor to perform the Work in accordance with Drawings and Specifications, such failure appearing after payment.

4. As conditioned in the performance bond and payment bond.

C. The making and acceptance of final payment shall constitute a waiver of all claims by the Contractor except those claims previously made and remaining unsettled (Article "Claims for Extra Cost").

D. Prior to submitting final Request for Payment to the Designer for approval, the Contractor shall fully comply with all requirements specified in Article "Final Inspection, Acceptance, and Project Closeout." These requirements include, but are not limited to the following:

1. Submittal of Product and Operating Manuals, Warranties and Bonds, Guarantees, Maintenance Agreements, properly certified As-Built Drawings, Record Drawings, Certificates of Inspection or Approval from agencies having jurisdiction. (The Designer must approve the Manuals prior to delivery to the Owner).

2. Transfer of required stock material and all keys in an organized manner.

3. Record of Owner's training.

4. Resolution of any final inspection discrepancies.

E. The Contractor shall forward to the Designer, the final Request for Payment along with the following documents:

1. List of minority business Subcontractors and material Suppliers showing breakdown of contracts amount.

2. Contractor's Affidavit of Release of Liens.

3. "Final Tax Certification" form with all fully completed "Periodic Payment Itemized Tax Statement" and "Periodic Payment Tax Certification" forms corresponding to each Request for Payment.

4. Affidavit of Contractor's payment to material Suppliers and Subcontractors. (See Article "Contractor's Affidavit").

5. Consent of Surety to Final Payment**.**

6. Certificates of state agencies required by state law.

7. Record Drawings

8. As-Built Drawings

F. The Designer will not authorize final payment until the Work under Contract has been certified by Designer, certificates of compliance issued, and the Contractor has complied with the closeout requirements. The Designer shall forward the Contractor's final Request for Payment to the Owner along with respective certificate(s) of compliance required by law.

G. After the request for final payment by the Contractor, all quantities of materials installed on the Project shall be reviewed for accuracy and any errant or outdated quantity information supplied on previously submitted Pay Applications, or any other source, shall be rectified on the Final Pay Application to reflect the actual quantity of materials installed on the Project.

ARTICLE 55 – PAYMENTS WITHHELD

A. The Designer, with the approval of the Owner, may withhold payment for the following reasons:

1. Faulty Work not corrected.

2. The unpaid balance on the Contract is insufficient to complete the Work in the judgment of the Designer.

3. To provide for sufficient Contract balance to cover liquidated damages that will be assessed.

4. Missing or improperly completed documentation required by the Contract Documents.

B. In addition to the reasons noted above, the Owner may authorize the withholding of payment for the following reasons:

1. Claims filed against the Contractor or evidence that a claim will be filed.

2. Evidence that Subcontractors have not been paid.

C. When grounds for withholding payments have been removed, payment will be released. Delay of payment due the Contractor without cause will make Owner liable for payment of interest to the Contractor as provided in NCGS 143-134.1.

ARTICLE 56 – ACCESS TO PERSONS AND RECORDS

The State Auditor and the using agency's internal auditors shall have access to persons and records as a result of all contracts or grants entered into by State agencies or political subdivisions in accordance with General Statute 147-64.7 and Session Law 2010-194, Section 21 (i.e., the State Auditors and internal auditors may audit the records of the Contractor during the term of the Contract to verify accounts and data affecting fees or performance).

ARTICLE 57 – TAXES

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the location of the Project which are applicable during the performance of the Work. Specific guidelines include the following:

B. Federal excise taxes do not apply to materials entering into state work (Internal Revenue Code, Section 3442(3)).

C. Federal transportation taxes do not apply to materials entering into state work (Internal Revenue Code, Section 3475(b) as amended).

D. North Carolina sales tax and use tax, as required by law, do apply to materials entering into state work and such costs shall be included in the bid proposal and Contract sum.

E. Local option sales and use taxes, as required by law, do apply to materials entering into state work as applicable and such costs shall be included in the bid proposal and Contract sum.

F. **The Amount of County Sales and Use Tax Paid Per Contractor's Statements**

1. Contractors shall give the Owner a signed statement containing the information listed in NCGS 105-164.14(e).

2. The Contractor shall submit a certified statement setting forth the Project, date, the type of property and the cost of the property purchased from each vendor, the county in which the vendor made the sale and the amount of local sales and use taxes paid thereon. If the property was purchased out-of-state, the county in which the property was delivered shall be listed. Sales receipts shall be included with the statement. The Contractor is hereby notified that the certified statement may be subject to audit.

3. In the event the Contractors make several purchases from the same vendor, such certified statement must indicate the invoice numbers, the inclusive dates of the invoices, the total amount of the invoices, the counties, and the county sales and use taxes paid thereon.

4. Name of taxing county: The position of a sale is the retailer's place of business located within a taxing county where the vendor becomes contractually obligated to make the sale. Therefore, it is important that the county tax be reported for the county of sale rather than the county of use.

5. When property is purchased from out-of-state vendors and the county tax is charged, the county should be identified where delivery is made when reporting the county tax.

6. Such statement must also include the cost of any tangible personal property withdrawn from the Contractor's warehouse stock and the amount of county sales or use tax paid thereon by the Contractor.

7. Similar certified statements by his Subcontractors must be obtained by the general Contractor and furnished to the claimant.

8. Contractors are not to include any tax paid on supplies, tools and equipment which they use to perform their contracts and should include only those building materials, supplies, fixtures and equipment which actually become a part of or annexed to the Work.

9. Contractor shall provide a completed "Final Tax Certification" form, including copies of all Periodic Payment Tax Certifications, with the application for final payment.

ARTICLE 58 – MINIMUM INSURANCE REQUIREMENTS

The Work under this Contract shall not commence until the Contractor has obtained all required insurance and verifying certificates of insurance have been approved in writing by the Owner. The Contractor shall provide and maintain, during the life of the Contract,

comprehensive general liability insurance, including coverage for premises operations, independent contractors, completed operations, products and contractual exposures, as shall protect such contractors from claims arising out of any bodily injury, including accidental death, as well as from claims for property damages which may arise from operations under this Contract, whether such operations be by the Contractor or by any Subcontractor, or by anyone directly or indirectly employed by either of them. The Contractor shall purchase and maintain property insurance during the life of this Contract, upon the entire Work at the Site to the full insurable value thereof that shall include the interests of the Owner, the Contractor, the Subcontractors in the Work and shall insure against the perils of fire, extended coverage, and vandalism and malicious mischief. If the Owner is damaged by failure of the Contractor to purchase or maintain such insurance, then the Contractor shall bear all reasonable costs properly attributable thereto; the Contractor shall effect and maintain similar property insurance on portions of the Work stored off the Site when Request for Payment per articles so includes such portions. The Contractor shall ensure that all Subcontractors are insured to at least the same extent required of the Contractor. Unless modified by the "Notice to Bidders," the minimum insurance requirements are as outlined below.

A. **Contractor's Liability Insurance**

1. Contractor shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:

    a. claims under workers' compensation, disability benefits, and other similar employee benefit acts;

    b. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;

    c. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;

    d. claims for damages insured by reasonably available personal injury liability coverage which are sustained: (i) by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or (ii) by any other person for any other reason;

    e. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and

    f. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle.

2. The policies of insurance so required by this paragraph to be purchased and maintained shall:

    a. with respect to insurance required by Paragraphs (A.1.c) through (A.1.f) inclusive, include as additional insureds (subject to any customary exclusion

in respect of professional liability) Owner, Designer, Designer's Consultants, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, partners, employees, agents, and other consultants and Subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

b. include at least the specific coverages and be written for not less than the limits of liability provided in the paragraph below Notice to Bidders, or required by Laws or Regulations, whichever is greater;

c. include completed operations insurance;

d. include contractual liability insurance covering Contractor's indemnity obligations;

e. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least thirty (30) days" prior written notice has been given to by certified mail/return receipt requested to Owner and Contractor and to each other additional insured to whom a certificate of insurance has been issued;

f. remain in effect at least until written Project acceptance and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work; and

g. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least three (3) years after final payment.

B. Property Insurance

1. Unless otherwise provided in the Notice to Bidders, Contractor shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof. This insurance shall:

   a. include the interests of Owner, Contractor, Subcontractors, Designer, Designer's consultants, and any other individuals or entities identified in the Notice to Bidders and the officers, directors, partners, employees, agents, and other consultants and Subcontractors of each and any of them, each of whom is deemed to have an insurable interest;

   b. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, false work, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, and such other perils or causes of loss as may be specifically required by the Notice to Bidders;

   c. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of Designers);

d. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in a Request for Payment recommended by Designer;

e. allow for partial utilization of the Work by Owner;

f. include testing and startup; and

g. be maintained in effect until final acceptance is made unless otherwise agreed to in writing by Owner, Contractor, and Designer with thirty (30) days" written notice to each other additional insured.

2. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained will contain a provision or endorsement that the coverage afforded will not be cancelled or materially changed or renewal refused until at least thirty (30) days prior to written notice has been given to Owner and Contractor and to each other additional insured.

3. Owner shall not be responsible for purchasing and maintaining any property insurance to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

4. If Contractor requests in writing that other special insurance be included in the property insurance policies, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order or Written Amendment. Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.

C. **Deductible**

Any deductible, if applicable to loss covered by insurance provided, is to be borne by the Contractor.

D. **Proof of Carriage**

The Contractor shall furnish the Owner with satisfactory proof of carriage of the insurance required before written approval is granted by the Owner.

E. **Limits of Liability**

Worker's Compensation

1. State: Statutory
2. Applicable Federal (e.g. Longshoreman's): Statutory
3. Employer's Liability: $500,000

Automobile Liability

1. Bodily Injury:
   $1,000,000 Each Person
   $1,000,000 Each Accident
   Property Damage:
   $1,000,000 Each Accident

or

2. Combined Single Limit (Bodily Injury and Property Damage):
   $1,000,000 Each Accident

Employer's Other Liability

1. Gen. Aggregate (except Products- Completed Operations): $2,000,000
2. Products- Completed Operations: $2,000,000
3. Personal & Advertising Injury (per person/organization): $1,000,000
4. Each Occurrence (Bodily Injury & Property Damages): $1,000,000
5. Excess Liability:
   a. General Aggregate: $2,000,000
   b. Each Occurrence: $2,000,000
6. Property damage liability insurance will provide Explosion, Collapse, and Underground coverage where applicable.
7. Pollution Liability: $1,000,000 per occurrence
8. Professional Liability: $1,000,000 per occurrence

F. **Receipt and Application of Insurance Proceeds**

1. Any insured loss under the policies of insurance will be adjusted with Owner and made payable to Owner as fiduciary for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order or Written Amendment.

2. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within fifteen (15) days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If so such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

G. Right of Recovery; Subrogation

Contractor shall have no right of recovery or subrogation against County (including its officers, agents and employees), it being the intention of the parties that the insurance policies so affected shall protect both parties and be primary coverage for any and all losses covered by the aforementioned insurance.

ARTICLE 59 – PERFORMANCE BOND AND PAYMENT BOND

A. Each Contractor shall furnish a performance bond and payment bond executed by a Surety company authorized to do business in North Carolina. The bonds shall be at least equal to the full Contract amount. Bonds shall be executed in the form bound with these Specifications. The bonds shall be delivered with the executed Contract. These bonds shall remain in effect at least through the warranty period, but in no case less than one year after the date of Owner acceptance of the Project.

B. All bonds shall be countersigned by an authorized agent of the bonding company who is licensed to do business in North Carolina and shall include a certified copy of such agent's authority to act.

C. If the Surety on any Bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located, Contractor shall within twenty (20) days thereafter substitute another Bond and Surety.

D. An additional performance guarantee with the North Carolina Department of Transportation may be required for Work performed in the right-of-way. In this event, the Contractor, within ten (10) days of receipt of the "Notice of Award," shall supply the Owner with a copy of the executed performance guarantee and evidence of acceptance by the NCDOT. The Contractor shall perform all Work within the right-of-way in accordance with the "Policies and Procedures for Accommodating Utilities on Highway Rights of Way" and the provisions of the Encroachment Agreement. Any necessary guarantees and agreements between the Contractor and NCDOT must be in place prior to the Contractor performing any construction activities within the NCDOT right-of-way. Failure of the Contractor to receive concurrence from the NCDOT allowing the Contractor to Work within the right of way shall not be grounds for extension of the Contract Time.

E. The Owner reserves the right to not release the Performance Bond until the NCDOT has approved the portion of the completed Work within the NCDOT right-of-way stipulated in the Project encroachment agreement.

ARTICLE 60 – CONTRACTOR'S AFFIDAVIT

The final payment of retained amount due the Contractor on account of the Contract shall not become due until the Contractor has furnished to the Owner through the Designer an affidavit signed, sworn and notarized to the effect that all payments for materials, services or subcontracted Work in connection with his Contract have been satisfied, and that no claims or liens exist against the Contractor in connection with this Contract. In the event that the Contractor cannot obtain similar affidavits from Subcontractors to protect the Contractor and the Owner from possible liens or claims against the Subcontractor, the Contractor shall state in his affidavit that no claims or liens exist against any Subcontractor to the best of his (the Contractor's) knowledge, and if any appear afterward, the Contractor shall save the Owner harmless.

ARTICLE 61 – ASSIGNMENTS

The Contractor shall not assign any portion of this Contract nor subcontract in its entirety. Except as may be required under terms of the performance bond or payment bond, no funds or sums of money due or become due the Contractor under the Contract may be assigned.

ARTICLE 62 – CLEANING UP

A. The Contractors shall keep the Project, buildings, and surrounding area reasonably free from rubbish at all times, and shall remove debris from the Site on a timely basis or when directed to do so by the Designer or Project Expediter. The Project Expediter shall provide an on-site refuse container(s) for the use of all Contractors. Each Contractor shall remove their rubbish and debris from the building on a daily basis. Disposal of waste material, rubbish, and other debris shall conform to applicable Laws and Regulations. The Project Expediter shall broom clean the building as required to minimize dust and dirt accumulation.

B. The Project Expediter shall provide and maintain suitable all-weather access to buildings.

C. Before final inspection and acceptance of buildings, each Contractor shall clean his portion of the Work, including glass, hardware, fixtures, masonry, tile and marble (using no acid), clean and wax all floors as specified, and completely prepare the building for use by the Owner, with no cleaning required by the Owner.

D. Prior to substantial completion of the Work, Contractor shall clean the Site and make it ready for utilization by Owner. At the completion of the Work, Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

E. All material including construction debris, etc., which is not to be used at the Project Site must be legally disposed of <u>off</u> the Project Site at the Contractor's expense. Survey stakes are not considered debris and shall be removed only at the direction of the Designer.

F. All Contractors are responsible for maintaining streets, parking lots, walks and grounds connecting to the Project area which shall be protected from deposits of mud, sand, stone, litter or debris of any form. All mud collected on vehicle wheels must be cleaned off by spraying each tire and the underside of vehicle before leaving the construction Site. Should any mud or debris from the construction Project collect on the streets, this shall be removed immediately.

ARTICLE 63 – GUARANTEE

A. The Contractor warrants and guarantees to Owner, Designer, and Designer's consultants that all Work shall be in accordance with the Contract Documents and will not be defective.

B. All warranties and guarantees shall expressly run to the benefit of the Owner.

C. The Contractor shall unconditionally guarantee materials and workmanship against patent defects arising from faulty materials, faulty workmanship or negligence for a period of twelve (12) months following the date of final acceptance of the Work and shall replace such defective materials or workmanship without cost to the Owner.

D. Where items of equipment or material carry a manufacturer's warranty for any period in excess of twelve (12) months, then the manufacturer's warranty shall apply for that particular piece of equipment or material. The Contractor shall replace such defective equipment or materials, without cost to the Owner, within the manufacturer's warranty period.

E. All warranties shall be construed under and in accordance with the State of North Carolina.

F. All materials and equipment incorporated into the Work shall be good quality and new, unless specified otherwise.

G. Additionally, the Owner may bring an action for latent defects caused by the negligence of the Contractor which is hidden or not readily apparent to the Owner at the time final acceptance in accordance with applicable law.

H. Additional guarantees for roof, equipment, materials, and supplies may be stipulated in the Specifications sections governing such roof, equipment, materials, or supplies.

I. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instruction of the applicable Supplier or manufacturer.

J. If required by the Designer, the Contractor shall provide satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

K. Any defective materials or workmanship replaced or repaired during the initial warranty period shall extend the warranty period for a period of twelve (12) months following Owner acceptance of the replacement material or workmanship.

ARTICLE 64 – INDEMNIFICATION

A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner, Designer, Designer's Consultants, and the officers, directors, partners, employees, agents, and other consultants and Subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage:

1. is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom; and

2. is caused in whole or in part by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts of them may be liable, regardless of whether or not caused in part by any negligence or omission of an individual or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Laws and Regulations regardless of the negligence of any such individual or entity.

B. In any and all claims against Owner or Designer or any of their respective consultants, agents, officers, directors, partners, or employees by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work of anyone for whose acts any of them may be liable, the indemnification obligation above shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability acts, or other employee benefit acts.

C. This Section shall survive any expiration or termination of the Contract.

ARTICLE 65 – CONTRACTOR EVALUATION

The Contractor's overall Work performance on the Project shall be fairly evaluated for determining qualifications to bid on future County capital improvement Projects. In addition to final evaluation, interim evaluation may be prepared during the progress of the Project. Evaluations shall be performed by the Owner and Designer. The Owner may request the Contractor's comments to evaluate the Designer.

BRUNSWICK COUNTY, NORTH CAROLINA

Brunswick County Courthouse Addition & Renovations
SUPPLEMENTARY GENERAL CONDITIONS

The Supplementary General Conditions contain changes and additions to the "Instructions to Bidders" and "General Conditions of the Contract."

ARTICLE 23 – UTILITIES, STRUCTURES, SIGNS

The Project Expediter shall pay all utility cost for the building addition until final acceptance by the owner. Responsibility for utility cost for the existing building will remain with the County.

ARTICLE 31 – CONSTRUCTION SUPERVISION

The general construction Contractor is the Project Expediter.

ARTICLE 38 – CHANGES IN THE WORK

1. Work Change Directives, when allowed, may be transmitted by e-mail.

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01 2200 Unit Prices
01 2300 Alternates
01 3000 Administrative Requirements
01 4000 Quality Requirements
01 4533 Special Inspections
01 5000 Temporary Facilities and Controls
01 5813 Temporary Project Signage
01 6000 Product Requirements and Substitutions
01 7000 Execution and Closeout Requirements
01 7419 Construction Waste Management and Disposal
01 7610 Temporary Protective Coverings
01 7800 Closeout Submittals
01 7900 Demonstration and Training

DIVISION 02 EXISTING CONDITIONS

02 4100 Demolition

DIVISION 03 CONCRETE

03 0516 Under slab Vapor Barrier
03 3000 Cast-In-Place Concrete

DIVISION 04 MASONRY

04 2000 Unit Masonry
04 7200 Cast Stone Masonry

DIVISION 05 METALS

05 1200 Structural Steel Framing
05 2100 Steel Joist Framing
05 3100 Steel Decking
05 4000 Cold-Formed Metal Framing
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05 5213 Pipe and Tube Railings
05 7500 Decorative Formed Metal

DIVISION 06 **WOOD, PLASTICS, AND COMPOSITES**

06 1000 Rough Carpentry
06 2000 Finish Carpentry
06 4100 Architectural Wood Casework
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07 0150.19 Preparation for Roofing Repair
07 2100 Thermal Insulation
07 2400 Exterior Insulation and Finish Systems
07 2500 Weather Barriers
07 4113 Metal Roof Panels
07 5100 Built-Up Bituminous Roofing Repair
07 5400 Thermoplastic Membrane Roofing
07 6200 Sheet Metal Flashing and Trim
07 7200 Roof Accessories
07 8100 Applied Fireproofing
07 8400 Firestopping
07 9200 Joint Sealants
07 9513 Expansion Joint Cover Assemblies

DIVISION 08 **OPENINGS**

08 1213 Hollow Metal Doors and Frames
08 1416 Flush Wood Doors
08 4229 Automatic Entrances
08 4313 Aluminum-Framed Storefronts
08 4413 Glazed Aluminum Curtain Walls
08 5659 Service and Teller Window Units
08 7100 Door Hardware
08 8000 Glazing
08 9100 Louvers

DIVISION 09 **FINISHES**

09 0561 Common Work Results for Flooring Preparation
09 2116 Gypsum Board Assemblies
09 3000 Tiling
09 5100 Acoustical Ceilings
09 6500 Resilient Flooring
09 6623 Resinous Matrix Terrazzo Flooring
09 6813 Tile Carpeting
09 9113 Exterior Painting
09 9123 Interior Painting
09 9600 High-Performance Coatings

DIVISION 10 **SPECIALTIES**

10 1400 Signage
10 2113.16 Phenolic Core Laminate Faced Toilet Compartments
10 2800 Toilet, Bath, and Laundry Accessories
10 4400 Fire Protection Specialties
10 5126 Plastic Lockers
10 5626 Mobile Storage Shelving

DIVISION 11 **EQUIPMENT**

11 1420 Pedestrian Security Gate
11 1500 Motorized Optical Turnstile
11 5213 Flat Screen TV Mounts

DIVISION 12 **FURNISHINGS**

12 3600 Countertops
12 4813 Entrance Floor Mats and Frames
12 6100 Fixed Seating - Jury Assembly Room
12 6760 Pews and Courtroom Furniture

DIVISION 21 FIRE SUPPRESSION
21 0000 Fire Protection

DIVISION 22 PLUMBING
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31 1000 Site Clearing
31 2000 Earth Moving
31 2319 Dewatering
31 3116 Termite Control
31 6316 Auger Cast Grout Piles

DIVISION 32 EXTERIOR IMPROVEMENTS
32 1216 Asphalt Paving
32 1313 Concrete Paving
32 1373 Concrete Paving Joint Sealants
32 1713 Parking Bumpers
32 1723 Pavement Markings
32 3100 Vertical Pivot Vehicle Gate
32 3119 Decorative Metal Fences

DIVISION 33 UTILITIES
33 4100 Storm Utility Drainage Piping

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Sawyer Sherwood & Associate Architecture
124 Market Street
Wilmington, NC 28401
Tel: 910-762-0892



John R. Sawyer, AIA
(Email: john@s2a3.com)

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END OF ARCHITECTURAL SPECIFICATIONS

CIVIL

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10/24/19
FIRM No. F-0113

STRUCTURAL

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DIVISION 01 GENERAL REQUIREMENTS
01 4533 Special Inspections

DIVISION 03 CONCRETE
03 3000 Cast-In-Place Concrete

DIVISION 05 METALS
05 1200 Structural Steel Framing
05 2100 Steel Joist Framing
05 3100 Steel Decking
05 4000 Cold-Formed Metal Framing
05 5000 Metal Fabrications

DIVISION 31 EARTHWORK
31 6316 Auger Cast Grout Piles



BRUNSWICK COUNTY COURTHOUSE
ADDITION & RENOVATIONS
BOLIVIA, NORTH CAROLINA

Plumbing, Mechanical, Electrical and Fire Protection
Construction Documents
September 23, 2019

DIVISION 21 – FIRE SUPPRESSION
21 0000 Fire Protection

DIVISION 22 – PLUMBING
22 0000 Plumbing

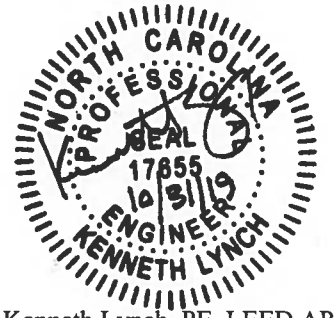
DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING
23 0500 Heating and Air Conditioning
23 0900 Direct Digital Control Systems

DIVISION 26 – ELECTRICAL
26 0000 Electrical, Basics
26 0500 Basic Materials and Methods
26 0519 Conductors and Cables
26 0526 Grounding and Bonding
26 0533 Raceways and Boxes
260 548 Seismic Controls for Electrical Systems
26 0553 Electrical Identification
26 0923 Lighting Control Devices
26 2416 Panelboards
26 2726 Wiring Devices
26 2816 Enclosed Switches and Circuit Breakers
26 5119 LED Interior Lighting

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY
28 3111 Digital, Addressable Fire-Alarm System
285000 Emergency Radio Communication Enhancement System
Appendix 285000 - Emergency Radio Communication Enhancement System



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CAPA Project #18048

SECTION 01 1000
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: Brunswick County Courthouse Addition & Renovations

B. Owner's Name: Brunswick County.

C. Architect's Name: Sawyer Sherwood & Associate, P.C..

D. The Project consists of the construction of a three story 15,000 sf addition and renovations of the existing courthouse providing 102,450 sf. The project will be phased to allow continuous use of the facility during construction.

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 00 5200 - Agreement Form

B. Contract type: Single Prime based on a stipulated sum determined by competitive bidding.

1.03 DESCRIPTION OF ALTERATIONS WORK

A. Scope of demolition and removal work is indicated on drawings and specified in Section 02 4100.

B. Owner will remove the following items before start of work:
   1. Movable furniture ..
   2. Files, records and office equipment .

1.04 WORK BY OWNER

A. Owner has awarded a contract for supply and installation of vioce and data cabling, terminations, and data equipment. which will commence in coordination with the construction schedule proposed and accepted by the owner..

B. Items noted NIC (Not in Contract) will be supplied and installed by Owner before Substantial Completion. Some items include:
   1. Furnishings.
   2. Small equipment.
   3. Artwork.

1.05 OWNER OCCUPANCY

A. Owner intends to continue to occupy adjacent portions of the existing building during the entire construction period. Phasing plans are provided in the bid document drawing set.

B. Owner intends to occupy the Project upon Substantial Completion.

C. Owner intends to occupy a certain portion of the Project prior to the completion date for the conduct of normal operations.

D. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

E. Schedule the Work to accommodate Owner occupancy.

1.06 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.
   1. Locate and conduct construction activities in ways that will limit disturbance to site.

B. Arrange use of site and premises to allow:
   1. Owner occupancy.
   2. Work by Others.
   3. Use of site and premises by the public.

C. Provide access to and from site as required by law and by Owner:

1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
2. Do not obstruct roadways, sidewalks, or other public ways without permit.

D. Existing building spaces may not be used for storage.

E. Time Restrictions:
1. Limit conduct of especially noisy exterior work to the hours of after 4pm and prior to 9am..

F. Utility Outages and Shutdown:
1. Limit disruption of utility services to hours the building is unoccupied.
2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
3. Prevent accidental disruption of utility services to other facilities.

1.07 WORK SEQUENCE

A. Construct Work in phases during the construction period:

B. Coordinate construction schedule and operations with Owner.

END OF SECTION

SECTION 01 2000
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Documentation of changes in Contract Sum and Contract Time.

1.02 RELATED REQUIREMENTS

A. Section 00 5000 - Contracting Forms and Supplements: Forms to be used.

B. Section 01 2200 - Unit Prices: Monetary values of unit prices; Payment and modification procedures relating to unit prices.

C. Section 01 7800 - Closeout Submittals: Project record documents.

1.03 SCHEDULE OF VALUES

A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.

C. Forms filled out by hand will not be accepted.

D. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.

E. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.

C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

D. Forms filled out by hand will not be accepted.

E. Execute certification by signature of authorized officer.

F. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.

G. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.

H. Submit one electronic and three hard-copies of each Application for Payment.

I. Include the following with the application:
   1. Transmittal letter as specified for submittals in Section 01 3000.
   2. Partial release of liens from major subcontractors and vendors.
   3. Affidavits attesting to off-site stored products.
   4. Insurance Certificates attesting specifically to the coverage of material stored off site and to the owners recovery through the insured for the cost of the materials stored in the event of loss.

J. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.05 MODIFICATION PROCEDURES

A. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ or subcontractors of changes to Contract Documents.

B. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.

C. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
   1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
   2. Promptly execute the change.

D. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications. Contractor shall prepare and submit a fixed price quotation. ____

E. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation. Document any requested substitutions in accordance with Section 01 6000.

F. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
   1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
   2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
   3. For pre-determined unit prices and quantities, the amount will based on the fixed unit prices.

G. Substantiation of Costs: Provide full information required for evaluation.
   1. On request, provide the following data:
      a. Quantities of products, labor, and equipment.
      b. Taxes, insurance, and bonds.
      c. Overhead and profit.
      d. Justification for any change in Contract Time.
      e. Credit for deletions from Contract, similarly documented.
   2. Support each claim for additional costs with additional information:
      a. Origin and date of claim.
      b. Dates and times work was performed, and by whom.
      c. Time records and wage rates paid.
      d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.

H. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

I. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

J. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

K. Promptly enter changes in Project Record Documents.

END OF SECTION

SECTION 01 2200
UNIT PRICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. List of unit prices, for use in preparing change order proposals for work for scope changes .

1.02 COSTS INCLUDED

A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work.

1.03 SCHEDULE OF UNIT PRICES

A. Item: 01 - Remedial Floor Coating; Section 09 0561 - Common Work Results for Flooring Preparation. State the cost per square yard to add or deduct this floor preparation work.

B. Item: 02-Communications, voice / data outlet box and conduit rough in. ; Section 26 0533 State the amount per wall outlet box and conduit raceway to above ceiling.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2300
ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Description of Alternates.

B. Procedures for pricing Alternates.

1.02 RELATED REQUIREMENTS

A. Document 00 2113 - Instructions to Bidders: Instructions for preparation of pricing for Alternates.

1.03 ACCEPTANCE OF ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.04 SCHEDULE OF ALTERNATES

A. Alternate No. G-1 - South Elevation renovations :
   1. State the amount to add to the base bid for removal of precast wall panels, new cast inplace wall panel with openings, aluminum curtain wall and glazing as shown refer to drawings 2-A2.1, 1-A3.2 and all details on sheet A5.3.

B. Alternate No. G-2 - Records Room 3018: State the amount to add to the base bid for reinforcing the existing floor structure under the mobile storage shelving as shown and noted on sheet S1.3. Also include in this alternate bid the cost to furnish and install the mobile storage shelving system shown on sheet A1.2 and specified in specification section 10 5626.

C. Alternate No. G-3 - Exit Turnstile, Main Entrance 1000 : State the amoun to add to the base bid for furnishing and installing the exit turnstiles and adjacent railings. Refer to specification section 11 1420. This alternate bid includes the electrical power circuit, chasing and repairing the flooring.

END OF SECTION

SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.
B. Electronic document submittal service.
C. Preconstruction meeting.
D. Site mobilization meeting.
E. Progress meetings.
F. Construction progress schedule.
G. Progress photographs.
H. Coordination drawings.
I. Submittals for review, information, and project closeout.
J. Number of copies of submittals.
K. Requests for Interpretation (RFI) procedures.
L. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. Section 01 6000 - Product Requirements & SUBSTITUTIONS: General product requirements.

1.03 REFERENCE STANDARDS

A. AIA G716 - Request for Information; 2004.

1.04 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 01 7000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
B. Make the following types of submittals to Architect:
    1. Requests for Interpretation (RFI).
    2. Requests for substitution.
    3. Shop drawings, product data, and samples.
    4. Test and inspection reports.
    5. Design data.
    6. Manufacturer's instructions and field reports.
    7. Applications for payment and change order requests.
    8. Progress schedules.
    9. Coordination drawings.
    10. Correction Punch List and Final Correction Punch List for Substantial Completion.
    11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
    1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction

punchlist, and any other document any participant wishes to make part of the project record.

2. Contractor and Architect are required to use this service.
3. It is Contractor's responsibility to submit documents in allowable format.
4. Subcontractors, suppliers, and Architect's consultants are to be permitted to use the service at no extra charge.
5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
6. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

B. Cost: The cost of the service is to be paid by Contractor; include the cost of the service in the Contract Sum.

C. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Architect and Contractor participating; further training is the responsibility of the user of the service.

D. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.02 PRECONSTRUCTION MEETING

A. Architect will schedule a meeting after Notice of Award.

B. Attendance Required:
1. Owner.
2. Architect.
3. Contractor.

C. Agenda:
1. Submission of list of subcontractors, list of products, schedule of values, and preliminary progress schedule.
2. Submission of initial Submittal schedule.
3. Designation of personnel representing the parties to Contract, _____ and Architect.
4. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
5. Scheduling.

D. 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.

3.03 SITE MOBILIZATION MEETING

A. Schedule meeting at the Project site prior to Contractor occupancy.

B. Attendance Required:
1. Contractor.
2. Owner.
3. Architect.
4. Contractor's superintendent.
5. Major subcontractors.

C. Agenda:
1. Use of premises by Owner and Contractor.
2. Owner's requirements.
3. Construction facilities and controls provided by Owner.
4. Temporary utilities provided by Owner.
5. Survey and building layout.

6. Security and housekeeping procedures.
7. Schedules.
8. Procedures for testing.
9. Procedures for maintaining record documents.
10. Requirements for start-up of equipment.
11. Inspection and acceptance of equipment put into service during construction period.

D. 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.

3.04 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at maximum monthly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required:
1. Contractor.
2. Owner.
3. Architect.
4. Special consultants.
5. Contractor's superintendent.
6. Major subcontractors.

D. Agenda:
1. Review minutes of previous meetings.
2. Review of work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of RFIs log and status of responses.
7. Review of off-site fabrication and delivery schedules.
8. Maintenance of progress schedule.
9. Corrective measures to regain projected schedules.
10. Planned progress during succeeding work period.
11. Coordination of projected progress.
12. Maintenance of quality and work standards.
13. Effect of proposed changes on progress schedule and coordination.
14. Other business relating to work.

E. 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.

3.05 CONSTRUCTION PROGRESS SCHEDULE

A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of work, with a general outline for remainder of work.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
1. Include written certification that major contractors have reviewed and accepted proposed schedule.

D. Within 10 days after joint review, submit complete schedule.

3.06 PROGRESS PHOTOGRAPHS

3.07 COORDINATION DRAWINGS

A. Provide information required by Project Coordinator for preparation of coordination drawings.

B. Review drawings prior to submission to Architect.

3.08 REQUESTS FOR INTERPRETATION (RFI)

A. Definition: A request seeking one of the following:
   1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in the Contract Documents.
   2. A resolution to an issue which has arisen due to field conditions and affects design intent.

B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.

C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of the Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
   1. Prepare a separate RFI for each specific item.
      a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
      b. Do not forward requests which solely require internal coordination between subcontractors.
   2. Prepare in a format and with content acceptable to Owner.
      a. Use AIA G716 - Request for Information.
   3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
   1. Include in each request Contractor's signature attesting to good faith effort to determine from the Contract Documents information requiring interpretation.
   2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
      a. Approval of submittals (use procedures specified elsewhere in this section).
      b. Approval of substitutions (see Section - 01 6000 - Product Requirements & SUBSTITUTIONS)
      c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
      d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
   3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.

E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
   1. Official Project name and number, and any additional required identifiers established in Contract Documents.
   2. Owner's, Architect's, and Contractor's names.
   3. Discrete and consecutive RFI number, and descriptive subject/title.
   4. Issue date, and requested reply date.
   5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
   6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
   7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract

Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

F. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

G. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
   1. Indicate current status of every RFI. Update log promptly and on a regular basis.
   2. Note dates of when each request is made, and when a response is received.
   3. Highlight items requiring priority or expedited response.
   4. Highlight items for which a timely response has not been received to date.
   5. Identify and include improper or frivolous RFIs.

H. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
   1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

I. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
   1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
   2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
   3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
   4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.09 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.
   1. Submit at the same time as the preliminary schedule specified in Section - 01 3216 - Construction Progress Schedule.
   2. Coordinate with Contractor's construction schedule and schedule of values.
   3. Format schedule to allow tracking of status of submittals throughout duration of construction.
   4. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
   5. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
      a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.10 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in the contract documents.

C. Samples will be reviewed for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

3.11 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Certificates.
   3. Test reports.
   4. Inspection reports.
   5. Manufacturer's instructions.
   6. Manufacturer's field reports.

B. Submit for Architect's knowledge as contract administrator or for Owner.

3.12 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.

D. Submit for Owner's benefit during and after project completion.

3.13 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
   1. After review, produce duplicates.
   2. Retained samples will not be returned to Contractor unless specifically so stated.

3.14 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Use a single transmittal for related items.
   2. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
   3. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
   4. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
      a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
   5. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
   6. Schedule submittals to expedite the Project, and coordinate submission of related items.
      a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.

b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 days.
c. For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect's approval, allow an additional 30 days.

7. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
8. Provide space for Contractor and Architect review stamps.
9. When revised for resubmission, identify all changes made since previous submission.
10. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.

B. Product Data Procedures:
1. Submit only information required by individual specification sections.
2. Collect required information into a single submittal.
3. Do not submit (Material) Safety Data Sheets for materials or products.

C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related work.
2. Use of reproductions of the Contract Documents in digital data form to create shop drawings is only permitted as defined _____.
3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

D. Samples Procedures:
1. Transmit related items together as single package.
2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.

3.15 SUBMITTAL REVIEW

A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.

B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.

C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.

END OF SECTION

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. References and standards.
B. Submittals.
C. References and standards.
D. Mock-ups.
E. Control of installation.
F. Tolerances.
G. Testing and inspection agencies and services.
H. Manufacturers' field services.
I. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.
B. Section 01 4216 - Definitions.

1.03 REFERENCE STANDARDS

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2014).
B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2017.
C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2015a, with Editorial Revision (2016).
D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2012a.
E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2018.
F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2015.
G. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2017.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Testing Agency Qualifications: Construction testing will be performed by a qualified firm employed by the Owner.
C. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the contract documents, or for Owner's information.
    1. Test Reports: After each test/inspection, promptly submit electronic copies of report to Architect, Structural Engineer,Civil Engineer and Contractor.
        a. Include:
            1) Date issued.
            2) Project title and number.
            3) Name of inspector.
            4) Date and time of sampling or inspection.
            5) Identification of product and specifications section.
            6) Location in the Project.

7) Type of test/inspection.
8) Date of test/inspection.
9) Results of test/inspection.
10) Compliance with Contract Documents.
11) When requested by Architect, provide interpretation of results.

b. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the contract documents, or for Owner's information.

D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

F. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
1. Submit report within 5 days of observation to Architect for information.
2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the contract documents.

G. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the contract documents.
2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

1.05 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.06 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Owner will employ and pay for services of an independent testing agency to perform specified on site quality control testing and inspection.

PART 3 EXECUTION

2.01 CONTROL OF INSTALLATION

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

B. Comply with manufacturers' instructions, including each step in sequence.

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

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

E. Have work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

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

2.02 MOCK-UPS

A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.

C. Integrated Exterior Mock-ups: Construct integrated exterior mock-up as indicated on drawings. Coordinate installation of exterior envelope materials and products as required in individual Specification Sections. Provide adequate supporting structure for mock-up materials as necessary.

D. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.

E. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

F. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.
   1. Architect will issue written comments within seven (7) working days of initial review and each subsequent follow up review of each mock-up.
   2. Make corrections as necessary until Architect's approval is issued.

G. Accepted mock-ups shall be a comparison standard for the remaining Work.

H. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

2.03 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

2.04 TESTING AND INSPECTION

A. See individual specification sections for testing required.

B. Testing Agency Duties:

1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
2. Perform specified sampling and testing of products in accordance with specified standards.
3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
5. Perform additional tests and inspections required by Architect.
6. Submit reports of all tests/inspections specified.

C. Limits on Testing/Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the Work.
3. Agency may not assume any duties of Contractor.
4. Agency has no authority to stop the Work.

D. Contractor Responsibilities:
1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
3. Provide incidental labor and facilities:
   a. To provide access to Work to be tested/inspected.
   b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
   c. To facilitate tests/inspections.
   d. To provide storage and curing of test samples.
4. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

F. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

2.05 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship,start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.

B. Submit qualifications of observer to Architect 15 days in advance of required observations.
1. Observer subject to approval of Engineer and Architect.
2. Observer subject to approval of Owner.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

2.06 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect in consultation with the owner will direct an appropriate remedy.

END OF SECTION

Statement of Special Inspections

Project: Brunswick County Courthouse Addition & Renovations
Location: Bolivia, NC
Owner's Representative: Mr. William L. Pinnix, PE
Owner's Address: 75 Courthouse Drive, Building I, Bolivia, NC 28422

Architect of Record: John Sawyer, AIA
Structural Engineer of Record: Jeffrey R. Troutman, PE

This Statement of Special Inspections is submitted as a condition for permit issuance in accordance with the Special Inspection requirements of the 2018 North Carolina State Building Code. It includes a Schedule of Special Inspection Services applicable to this project as well as the name of the Special Inspector and the identity of other approved agencies intended to be retained for conducting these inspections.

The Special Inspector shall keep records of all inspections and shall furnish inspection reports to the Structural Engineer and Architect of Record. Discovered discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Structural Engineer and Architect of Record. The Special Inspections program does not relieve the Contractor of his or her responsibilities.

Interim reports shall be submitted to the Owner, Structural Engineer and Architect of Record.

Interim Report Frequency: Monthly

A Final Report of Special Inspections documenting completion of all required Special Inspections and correction of any discrepancies should be submitted prior to issuance of a Certificate of Use and Occupancy.

Job Site safety and means and methods of construction are solely the responsibility of the Contractor.

Statement of Special Inspections Prepared by (Structural Engineer of Record):

Jeffrey R Troutman, PE
(Type or print name)

Signature 10.28.2019 Date

NORTH CAROLINA PROFESSIONAL SEAL 025671 ENGINEER JEFFREY R. TROUTMAN

10.28.2019

Owner's Authorization

Accepted by Brunswick County Inspections:

Signature	Date	Signature	Date

Schedule of Special Inspection Services

The following sheets comprise the required schedule of special inspections for this project. The construction divisions which require special inspections for this project are as follows.

- ☒ Structural Steel
- ☒ Cold-Formed Steel Framing
- ☒ Cast-in-Place Concrete
- ☒ Masonry
- ☐ Wood Construction
- ☒ Soils
- ☒ Soils
- ☒ Special Foundations (Piles)
- ☒ Wall Panels/Veneer
- ☒ Sprayed Fire-Resistant Material
- ☒ Exterior Insulation & Finish System
- ☒ Smoke Control
- ☐ Fire Rated Penetrations & Joints
- ☒ Wind-Resisting Requirements
- ☒ Seismic Requirements

Inspection Agents	Qualifications	Address
1. Special Inspector	SI	
2. Structural Engineer of Record Criser Troutman Tanner Consulting Engineers	SER	3809 Peachtree Avenue, Suite 102 Wilmington, NC 28403
3. Testing Laboratory	ITL	
4. Other		

Note: The inspection and testing agent shall be engaged by the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Architect, prior to commencing work.

Seismic Design Category: C

Ultimate Design Wind Speed: 147 MPH

Wind Exposure Category: C

Schedule of Special Inspection Services
Structural Steel

Item	Qualifications	Scope
1. Fabricator Certification/Quality Control Procedures	SI SI SI SI	• Collect and review fabricator & erector documents (verify reports and certificates as listed in AISC 360, Chapter N, paragraph 3.2 for compliance with construction documents) • Collect Certificate of Compliance from fabricator at completion of fabrication. • Verify material for structural steel. Review structural steel mill test reports. • Review fabricator's certified test reports.
2. Welding	SI SI SI SI SI	• Continuous inspection of welding of complete and partial penetration grove welds (radiographic or ultrasonic testing) • Periodic inspection of single and multipass fillet welds. • Continuous inspection of stud welding. • Collect certificate of compliance for weld filler material. • Identify use of approved filler material and in accordance with AWS D1.1.
3. Metal Deck	SI SER / SI	• Collect material data sheets for decking and connectors or fasteners, confirm identification markings conform to AISC 360 for structural steel and that other steel conforms to ASTM standards specified in the approved construction documents. • Periodic inspection of connections of decking
4. Open-Web Steel Joists	SI SI	• Periodic inspection to verify end connections per SJI 2207.1. • Periodic inspection to verify standard bridging (horizontal and diagonal) per SJI 2207.1 and bridging that differs from the SJI specifications listed in SJI 2207.1.
4. Structural Details	SER / SI	• Periodic inspection of steel framing and joint details at each connection.
5. Bolting	SI SI SER / SI SI	• Collect material data sheets for bolts, nuts, and washers & confirm identification markings conform to ASTM standards specified in the approved construction documents. • Collect certificate of compliance from bolt supplier • Periodic inspection of bolted connections. • Continuous inspection and collection of embedment submittals. Verify diameter, grade, type, length, embedment and anchors.
6. Material Certification	SI	• Collect Certified mill test reports.

Schedule of Special Inspection Services
Cold-Formed Steel Framing

Item	Qualifications	Scope
1. Plant Certification/ Quality Control Procedures	SI	• Collect certificate of compliance from fabricator at completion of fabrication.
2. Mechanical Connections	SER / SI	• Periodic inspection of all field connections (screw/bolt size and quantity), including anchorage to the structural frame in accordance with the approved construction document submittal.
3. Framing Details	SER / SI	• Periodic inspection framing and details.

Schedule of Special Inspection Services
Cast-in-Place Concrete

Item	Qualifications	Scope
1. Mix Design/Material Certifications	SER / SI	• Collect mix designs and verify appropriate mix use during specific installation
2. Reinforcement Installation	SER / SI SI	• Periodic inspection of reinforcing steel and welded wire fabric • Collection of certified mill test reports
3. Concrete Placement/Monitoring Fresh Concrete, Sampling & prep of test samples	SI SI SI / ITL SI	• Continuous inspection of cast-in-place concrete placement. • Periodic inspection of formwork for shape, location and dimensions of the concrete member being formed. • Continuous monitoring of sampling of fresh concrete, slump test, air content test, temperature of concrete and creation of strength test specimens • Continuous inspection of bolts, anchors and other embedments to be installed in concrete prior to and during placement
5. Post-Installed Anchors in Hardened Concrete	SI SI	• Continuous inspection of adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads. • Periodic inspection of mechanical anchors and adhesive anchors not sustaining sustained tension loads.
5. Curing & Protection	SI	• Periodic inspections of curing techniques and specified curing temperatures.

Schedule of Special Inspection Services
Masonry (Level B Quality Assurance)

Item	Qualifications	Scope
1. Material Certification	SI SI SI	• Collect mix design for mortar • Collect mix design for grout • Collect Certificates of Compliance for masonry constituents • Periodic inspection to verify compliance with approved submittals.
2. Mixing of Mortar & Grout	SI	• Periodic inspection of site prepared mortar.
3. Installation of Masonry	SI SER / SI	• Inspection of construction of mortar joints, prior to beginning masonry construction and during construction • Periodic inspection to verify size and location of structural masonry elements.
4. Reinforcement Installation	SER / SI SER / SI	• Verify location of reinforcement and connections to structure prior to construction • Prior to grouting verify size, grade, and placement of reinforcement and connection of masonry to structural frame
5. Grouting Operations	SI SI SI SI SI SI SI	• Continuous inspection to verify slump flow as delivered to the project. • Periodic inspection to verify proportions of site-mixed mortar & grout. • Periodic inspection to verify grade, type and size of reinforcement, anchor rods and anchorages. • Periodic inspection to verify construction of mortar joints. • Periodic inspection to verify grout space prior to grouting. • Periodic inspection to verify placement of reinforcement, connectors and anchorages. • Continuous observation of the placement of all grout, conforming cleanliness of grout space placement of the reinforcing connectors.
6. Weather Protection	SI	• Periodic inspection to verify preparation, construction and protection techniques for construction of masonry during cold weather (temperatures below 40ºF) or hot weather (temperatures above 90ºF)
7. Verification and Evaluation of Masonry Strength	SI / ITL	• Periodic inspection of the preparation of grout specimens, mortar specimens and observation of preparation of prisms and verification of f'm prior to construction by unit strength or prism test method.

Schedule of Special Inspection Services
Soils

Item	Qualifications	Scope
1.Site Preparation	SI SI	• Periodic inspection to determine that site and has been prepared in accordance with the approved soils report, prior to placement of compacted fill. • Periodic inspection to verify materials below shallow foundations (slab-on-grade) are adequate to achieve the design bearing capacity.
2. Fill Placement	SI SI	• Continuous inspection to determine use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill. • Periodic inspection to perform classification and testing of compacted fill materials.
3. Density Evaluation	SI / ITL	• Determine that in-place dry density of the compacted fill complies with approved soils report

Schedule of Special Inspection Services

Special Foundations (Cast-In-Place Deep Foundations)

Item	Qualifications	Scope
1.Pile Foundations	SI / SER SI SI SI SI	• Continuous inspection to observe drilling operations and maintain complete and accurate records. • Continuous inspection to verifiy placement locations and plumbness; Confirm element diameter; Confirm element length; Record concrete or grout volumes. • Periodic inspection to verify when pile foundations are being installed. • Continuous inspection to record top and tip elevation of each pile relative to a permanent reference. • Perform tests and inspection in accordance with the Schedule of Special Inspection Services for Cast-in-Place Concrete

Schedule of Special Inspection Services
Wall Panels and Veneers

Item	Qualifications	Scope
1. Anchorage	SI SI	• Continuous inspection of size and location of anchorage of veneer. • Continuous inspection of anchorage of wall panels to existing/new framing.
2. Material Certification	SI SI SI	• Collect mix design for mortar • Collect mix design for grout • Certificates of Compliance for masonry constituents
3. Mixing of Mortar & Grout	SI / ITL	• Periodic inspection of site prepared mortar
4. Installation of veneer	SI SI / SER	• Inspection of construction of mortar joints, prior to beginning masonry construction and during construction • Verify size and location of structural elements
5. Reinforcement Installation	SI / SER SI / SER	• Verify location of reinforcement and connections to structure prior to construction • Prior to grouting verify size, grade, and placement of reinforcement and connection of masonry to structural frame
6. Grouting Operations	SI	• Continuous observation of the placement of all grout, conforming cleanliness of grout space placement of the reinforcing connectors.
7. Weather Protection	SI	• Periodically verify protection techniques for construction of masonry below 40ºF and above 90ºF
8. Observation of the Evaluation of Masonry Strength	SI	• Continuous observation of the preparation of grout specimens, mortar specimens and or prisms.

Schedule of Special Inspection Services
Sprayed On Fire-Resistant Materials

Item	Qualification	Scope
1. Fireproofing of Steel	SI / ITL SI / ITL SI / ITL SI / ITL SI / ITL	• Periodic inspection to verify preparation of substrate condition prior to installation in accordance with approved fire resistance design and approved manufacturer's written instructions. • Periodic inspection to verify that substrate has minimum ambient temperature before and after application as specified by the fire resistance design and approved manufacturer's written instructions • Periodic inspection to verify average thickness of sprayed on fire-resistant material applied to structural members per fire resistance design and approved manufacturer's written instructions • Periodic inspection to verify density of sprayed on material per fire resistance design and approved manufacturer's written instructions • Periodic inspection to verify/test bond strength to ensure a value greater than 150 ponds per square foot to the extent specified in NCSBC Section 1705.14.6.

Schedule of Special Inspection Services
Exterior Insulation and Finish Systems (EIFS)

Item	Qualifications	Scope
1. Fabrication	SI	• Periodic inspection to verify quality control program and inspect the fabrication plant as required to confirm that materials, methods, products and quality control comply with project specifications.
2. Application	SI SI SI SI SI	• Periodic inspection to verify that EIFS materials, details and installation are installed in conformance with the approved construction documents. • Periodic inspection to verify correct installation of reinforcing mesh and application of base coat. • Periodic inspection to visually inspect all transitions in material and joint sealants, including windows, doors and run-out flashings. • Periodic inspection to verify water-resistive barrier over sheathing substrate. • Conduct water penetration testing in accordance with NCSBC Section 1403.2, exception 2.

Schedule of Special Inspection Services
Smoke Control

Item	Qualifications	Scope
1. Smoke Evacuation System	SI / Independent Inspector	• During erection of ductwork and prior to concealment leak test and record locations of devices • Upon completion of smoke control system perform pressure difference testing, flow measurements and detection and control verification

Schedule of Special Inspection Services
Wind-Resisting Components

Item	Qualifications	Scope
1. Roof Cladding	SI	• Periodic inspection of submittal reviews and field verification of roof covering, roof deck and roof anchorage to roof and floor diaphragms in accordance with the approved submittals.
2. Wall Cladding/Coverings, Parapet & Connections	SI	• Periodic inspection of submittal reviews and field verification of wall/parapet anchorage and wall coverings to roof and floor diaphragms and framing in accordance with the approved submittals.

Schedule of Special Inspection Services
Seismic Requirements

Item	**Qualifications**	**Scope**
1. Plumbing, mechanical and electrical components	SI SI	• Periodic inspection during the anchorage of electrical equipment used for emergency power systems. • Periodic special inspection of installation of other electrical equipment.
2. Mechanical & Electrical Component and attachment testing	SI	• Periodic inspection during the anchorage of mechanical equipment vibration isolation systems where the approved construction documents require a nominal clearance of ¼-inch or less between the equipment support frame and restraint.
3. Seismic masonry testing	SI SI SI	• Verification of f'm prior to construction • Verification of f'm every 5000 square feet during construction • Verification of proportions of materials in mortar and grout as delivered to the site

CONTRACTOR'S STATEMENT OF RESPONSIBILITY

PROJECT: Brunswick County Courthouse Addition & Renovations

LOCATION: Bolivia, NC

County ID#: _____

OWNER: Brunswick County

DESIGNER: Criser Troutman Tanner Consulting Engineers - SER

PRIME CONTRACTOR: _____

CONTRACTOR RESPONSIBLE: _____

SYSTEM/COMPONENT: _____

I (we) acknowledge the special requirements outlined in the quality assurance plan. I (we) also acknowledge that control will be exercised to obtain conformance with the construction documents as approved by the Office of State Construction.

The following procedures will be established and strictly followed to maintain control within our organization:

_____

_____

_____

_____

The following reporting will be submitted to the Special Inspector, Owner and Office of State Construction at the following frequency:

Reporting method: _____

Frequency: _____

The following individuals(s) will be responsible for monitoring the procedures as set forth above:

Name: _____

Title: _____

Qualifications: _____

Signed this ____day of _____.

_____ _____

Name *Title*

SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities.

B. Temporary telecommunications services.

C. Temporary sanitary facilities.

D. Temporary Controls: Barriers, enclosures, and fencing.

E. Security requirements.

F. Vehicular access and parking.

G. Waste removal facilities and services.

H. Project identification sign.

I. Field offices.

1.02 RELATED REQUIREMENTS

A. Section 01 5813 - Temporary Project Signage.

1.03 TEMPORARY UTILITIES

A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.

B. New permanent facilities may be used.

C. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.04 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.

B. Telecommunications services shall include:

1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
2. Internet Connections: Minimum of one; DSL modem or faster.
3. Email: Account/address reserved for project use.

1.05 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Maintain daily in clean and sanitary condition.

1.06 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.07 FENCING

A. Construction: Commercial grade chain link fence.

1.08 EXTERIOR ENCLOSURES

A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.09 INTERIOR ENCLOSURES

A. Provide temporary partitions and ceilings to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.

B. Construction: Framing and reinforced polyethylene sheet materials with closed joints and sealed edges at intersections with existing surfaces:

1.10 VEHICULAR ACCESS AND PARKING

A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.

B. Coordinate access and haul routes with governing authorities and Owner.

C. Provide and maintain access to fire hydrants, free of obstructions.

D. Provide means of removing mud from vehicle wheels before entering streets.

E. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.11 WASTE REMOVAL

A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

C. Provide containers with lids. Remove trash from site periodically.

1.12 PROJECT IDENTIFICATION

A. Provide project identification sign of design and construction indicated on drawings.

B. Erect on site at location indicated.

C. No other signs are allowed without Owner permission except those required by law.

1.13 FIELD OFFICES

A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.

B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

1.14 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

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

D. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 5813
TEMPORARY PROJECT SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project identification sign.

B. Project informational signs.

1.02 QUALITY ASSURANCE

A. Design sign and structure to withstand 50 miles/hr wind velocity.

B. Sign Painter: Experienced as a professional sign painter for minimum three years.

C. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawing: Show content, layout, lettering, color, foundation, structure, sizes and grades of members.

PART 2 PRODUCTS

2.01 SIGN MATERIALS

A. Structure and Framing: New, wood, structurally adequate.

B. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum 3/4 inch thick, standard large sizes to minimize joints.

C. Rough Hardware: Galvanized.

D. Paint and Primers: Exterior quality, two coats; sign background of _____ color.

E. Lettering: Pre-cut vinyl self-adhesive products, _____.

2.02 PROJECT IDENTIFICATION SIGN

A. One painted sign of construction, design, and content indicated on drawings, location designated.

B. Content:
   1. Project number, title, logo and name of Owner as indicated on Contract Documents.
   2. Names and titles of authorities.
   3. Names and titles of Architect and Consultants.
   4. Name of Prime Contractor and major Subcontractors.

C. Graphic Design, Colors, Style of Lettering: Designated by Architect.

2.03 PROJECT INFORMATIONAL SIGNS

A. Painted informational signs of same colors and lettering as Project Identification sign, or standard products; size lettering to provide legibility at 100 foot distance.

B. Provide at each field office, storage shed, and directional signs to direct traffic into and within site. Relocate as Work progress requires.

C. Provide municipal traffic agency directional traffic signs to and within site.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install project identification sign within 30 days after date fixed by Notice to Proceed.

B. Erect at designated location.

C. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.

D. Install sign surface plumb and level, with butt joints. Anchor securely.

E. Paint exposed surfaces of sign, supports, and framing.

3.02 MAINTENANCE

A. Maintain signs and supports clean, repair deterioration and damage.

3.03 REMOVAL

A. Remove signs, framing, supports, and foundations at completion of Project and restore the area.

END OF SECTION

SECTION 01 6000
PRODUCT REQUIREMENTS & SUBSTITUTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Transportation, handling, storage and protection.

B. Product option requirements.

C. Substitution limitations.

D. Procedures for Owner-supplied products.

E. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Lists of products to be removed from existing building.

B. Section 01 1000 - Summary: Identification of Owner-supplied products.

C. Section 01-3000 - Administrative Requirements : Submittals

D. Section 01 4000 - Quality Requirements: Product quality monitoring.

E. Section 01 7419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.03 REFERENCE STANDARDS

A. 16 CFR 260.13 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; Recycled Content; Current Edition.

1.04 QUALITY ASSURANCE

A. Recycled Content: Determine percentage of post-consumer and pre-consumer (post-industrial) content separately, using the guidelines contained in 16 CFR 260.13.
   1. Previously used, reused, refurbished, and salvaged products are not considered recycled.
   2. Wood fabricated from timber abandoned in transit to original mill is considered reused, not recycled.
   3. Determine percentage of recycled content of any item by dividing the weight of recycled content in the item by the total weight of materials in the item.
   4. Determine value of recycled content of each item separately, by multiplying the content percentage by the value of the item.
   5. Acceptable Evidence:
      a. For percentage of recycled content, information from manufacturer.
      b. For cost, Contractor's cost data.

PART 2 PRODUCTS

2.01 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.

B. Use of products having any of the following characteristics is not permitted:
   1. Containing lead, cadmium, or asbestos.

C. Where other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 01 6116.
   2. If wet-applied, have lower VOC content, as defined in Section 01 6116.

2.02 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

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

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer product not named but meeting specifications.

2.03 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver and place in location as directed; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. Architect & design team consultants will consider requests for substitutions if submitted for review and determination 10 days or more prior to date of bid opening.

B. Substitutions may be considered when a product becomes unavailable due to discontinued manufacturing of the product or other conditions that could not be anticipated and are not manageable by the Contractor.

C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

D. A request for substitution constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.
   5. Will reimburse Owner, Architect and design team for review or redesign services associated with re-approval by authorities.

E. Substitutions will not be considered after reciept of project bids when they are indicated or implied on shop drawings or product data submittals.

3.02 OWNER-SUPPLIED PRODUCTS

A. See Section 01 1000 - Summary for identification of Owner-supplied products.

B. Owner's Responsibilities:
   1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
   2. Arrange and pay for product delivery to site.
   3. On delivery, inspect products jointly with Contractor.
   4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
   5. Arrange for manufacturers' warranties, inspections, and service.

C. Contractor's Responsibilities:
   1. Review Owner reviewed shop drawings, product data, and samples.
   2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
   3. Handle, store, install and finish products.
   4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 7419.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Provide off-site storage and protection when site does not permit on-site storage or protection.

G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

H. Comply with manufacturer's warranty conditions, if any.

I. Do not store products directly on the ground.

J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

K. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

L. Prevent contact with material that may cause corrosion, discoloration, or staining.

M. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

N. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 7000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Pre-installation meetings.

C. Cutting and patching.

D. Surveying for laying out the work.

E. Cleaning and protection.

F. Starting of systems and equipment.

G. Demonstration and instruction of Owner personnel.

H. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

I. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. Section 01 3000 - Administrative Requirements: Submittals procedures, Electronic document submittal service.

C. Section 01 4000 - Quality Requirements: Testing and inspection procedures.

D. Section 01 5000 - Temporary Facilities and Controls: Temporary exterior enclosures.

E. Section 01 7419 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.

F. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.

G. Section 23 0800 - Commisioning, Testing & Balancing

H. Section 02 4100 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.

1.03 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
   1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences. Include design drawings and calculations for bracing and shoring.
   2. Identify demolition firm and submit qualifications.
   3. Include a summary of safety procedures.

C. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.05 QUALIFICATIONS

A. For demolition work, employ a firm specializing in the type of work required.
   1. Minimum of ___ years of documented experience.

B. For survey work, employ a land surveyor registered in the State in which the Project is locatedand acceptable to Architect. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

C. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.

D. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.06 PROJECT CONDITIONS

A. Use of explosives is not permitted.

B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

D. Perform dewatering activities, as required, for the duration of the project.

E. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

F. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
   1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.

G. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
   1. Minimize amount of bare soil exposed at one time.
   2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
   3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
   4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

H. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.07 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.

B. Notify affected utility companies and comply with their requirements.

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

D. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

E. Coordinate completion and clean-up of work of separate sections.

F. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

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

B. Seal cracks or openings of substrate prior to applying next material or substance.

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

3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect 5 days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Contractor shall locate and protect survey control and reference points.

D. Control datum for survey is that established by Owner provided survey.

E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

F. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

H. Utilize recognized engineering survey practices.

I. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.

2. Grid or axis for structures.
3. Building foundation, column locations, ground floor elevations.

J. Periodically verify layouts by same means.

K. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. Perform whatever cutting and patching is necessary to:
1. Complete the work.
2. Fit products together to integrate with other work.
3. Provide openings for penetration of mechanical, electrical, and other services.
4. Match work that has been cut to adjacent work.
5. Repair areas adjacent to cuts to required condition.
6. Repair new work damaged by subsequent work.
7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-complying work.

C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing.

D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

F. Restore work with new products in accordance with requirements of Contract Documents.

G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

H. Patching:
1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
2. Match color, texture, and appearance.
3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.07 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.08 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

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

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

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

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

G. Prohibit traffic from landscaped areas.

H. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.09 SYSTEM STARTUP

A. Coordinate with requirements of Section 23-0800 - Commissioning, Testing & Balancing.

B. Coordinate schedule for start-up of various equipment and systems.

C. Notify Architect and Owner seven days prior to start-up of each item.

D. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

E. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

F. Verify that wiring and support components for equipment are complete and tested.

G. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

H. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

I. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

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

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

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

D. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Owner's personnel.

E. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

G. The amount of time required for instruction on each item of equipment and system is that specified in individual sections.

3.11 ADJUSTING

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

B. Testing, adjusting, and balancing HVAC systems: See Section 23 0800

3.12 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.
   1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.

B. Use cleaning materials that are nonhazardous.

C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

F. Clean filters of operating equipment.

G. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, drainage systems, and _____.

H. Clean site; sweep paved areas, rake clean landscaped surfaces.

I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
   1. Provide copies to Architect and Owner.

B. Accompany Architect & Consulting Engineers on preliminary inspection to determine items to be listed for completion or correction in Contractor Notice of Substantial Completion.

C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.14 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

C. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

D. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 01 7419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
   1. Aluminum and plastic beverage containers.
   2. Corrugated cardboard.
   3. Wood pallets.
   4. Land clearing debris, including brush, branches, logs, and stumps; see Section 31 1000 - Site Clearing for use options.
   5. Concrete: May be crushed and used as riprap, aggregate, sub-base material, or fill.
   6. Bricks: May be used on project if whole, or crushed and used as landscape cover, sub-base material, or fill.
   7. Concrete masonry units: May be used on project if whole, or crushed and used as sub-base material or fill.
   8. Asphalt paving: May be recycled into paving for project.
   9. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
   10. Glass.
   11. Plastic buckets.
   12. Rigid foam insulation.
   13. Fluorescent lamps (light bulbs).

E. Contractor shall submit Waste Disposal Reports. Submit monthly with payment application; all landfill disposal, incineration, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.

F. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.

G. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.

H. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. Section 01 7000 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

C. Section 31 1000 - Site Clearing: Handling and disposal of land clearing debris.

1.03 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

PART 3 EXECUTION

2.01 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Preconstruction meeting.
   2. Regular job-site meetings.
   3. Job safety meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.

1. Provide containers as required.
2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

END OF SECTION

SECTION 01 7610

TEMPORARY PROTECTIVE COVERINGS

PART 2 PRODUCTS

END OF SECTION

SECTION 01 7800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project Record Documents.

B. Operation and Maintenance Data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.

C. Individual Product Sections: Specific requirements for operation and maintenance data.

D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect at substantial completion.

B. Operation and Maintenance Data:
   1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
   2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   3. Submit one electronic (pdf document) of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   4. Submit electronic (pdf document) set of revised final documents in final form within 10 days after final inspection.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 3 EXECUTION

2.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Addenda.
   3. Change Orders and other modifications to the Contract.
   4. Reviewed shop drawings, product data, and samples.
   5. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Measured depths of foundations in relation to finish first floor datum.

2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
4. Field changes of dimension and detail.
5. Details not on original Contract drawings.

2.02 OPERATION AND MAINTENANCE DATA SUBMITTED IN ELECTRONIC (PDF DOCUMENT) FORM.

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

2.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
1. Product data, with catalog number, size, composition, and color and texture designations.
2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional information as specified in individual product specification sections.

E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

F. Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

2.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

B. Provide documentation as specified in PME and Fire Suppression spec sections.

2.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

D. Prepare data in the form of an instructional manual.

E. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

F. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

G. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

H. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

I. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

J. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

K. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

L. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
   1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.
   2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
      a. Significant design criteria.
      b. List of equipment.
      c. Parts list for each component.
      d. Operating instructions.
      e. Maintenance instructions for equipment and systems.
      f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
   3. Part 3: Project documents and certificates, including the following:
      a. Shop drawings and product data.
      b. Air and water balance reports.
      c. Certificates.
      d. Photocopies of warranties and bonds.

2.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

END OF SECTION

SECTION 01 7900
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures; except:
   1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
   2. Submit one copy to the Commissioning Authority, not to be returned.
   3. Make commissioning submittals on time schedule specified by Commissioning Authority.
   4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of overall Training Plan; submit in editable electronic format, Microsoft Word 2003 preferred.

1.03 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
   1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
   2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

END OF SECTION

SECTION 02 4100

DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selective demolition of building elements for alteration purposes.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Limitations on Contractor's use of site and premises.

B. Section 01 1000 - Summary: Sequencing and staging requirements.

C. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

D. Section 01 7000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

E. Section 01 7419 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.04 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Company specializing in the type of work required.

PART 3 EXECUTION

2.01 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. Schedule demolition with owner and the clerk of courts office to minimize disruption of court proceedings. Facility will remain occupied throughout the construction period. Refer to the phasing plans in the project drawing set.
   3. NFPA 241 2019 Edition, 2019 Standard for Safeguarding Construction, Alteration, and Demolition Operations
   4. Provide, erect, and maintain temporary barriers and security devices.
   5. Provide, erect and maintain dust control partitions isolating work areas from occupied areas.
   6. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   7. Do not close or obstruct roadways or sidewalks without permit.
   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. Do not begin demolition until built elements to be salvaged or relocated have been removed.

D. Protect existing structures and other elements that are not to be 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.

E. 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.

F. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

G. Perform demolition in a manner that maximizes salvage and recycling of materials.
   1. Dismantle existing construction and separate materials.
   2. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

2.02 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; 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.

2.03 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as 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 other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 5000 in locations indicated on drawings.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.

D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
   2. Remove items indicated on drawings.

E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
   1. Maintain existing active systems that are to remain in operation; 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 01 1000 for other limitations on outages and required notifications.
   4. Verify that abandoned services serve only abandoned facilities before removal.

5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

F. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch as specified for patching new work.

2.04 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Remove from site all materials not to be reused on site; comply with requirements of Section 01 7419 - Waste Management.

C. Leave site in clean condition, ready for subsequent work.

D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 03 0516
UNDERSLAB VAPOR BARRIER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet vapor barrier under concrete slabs on grade.

1.02 RELATED REQUIREMENTS

A. Section 03 1000 - Concrete Forming and Accessories: Forms and accessories for formwork.

B. Section 03 2000 - Concrete Reinforcing.

C. Section 03 3000 - Cast-in-Place Concrete: Preparation of subgrade, granular fill, placement of concrete.

1.03 REFERENCE STANDARDS

A. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2011 (Reapproved 2017).

B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products.

C. Samples: Submit samples of underslab vapor barrier to be used.

D. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction.

PART 2 PRODUCTS

2.01 MATERIALS

A. Underslab Vapor Barrier:
   1. Water Vapor Permeance: Not more than 0.010 perms, maximum.
   2. Thickness: 15 mils.
   3. Basis of Design:
      a. Stego Industries LLC; Stego Wrap Vapor Barrier (15-mil): www.stegoindustries.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

B. Accessory Products: Vapor barrier manufacturer's recommended tape, adhesive, mastic, etc., for sealing seams and penetrations in vapor barrier.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surface over which vapor barrier is to be installed is complete and ready before proceeding with installation of vapor barrier.

3.02 INSTALLATION

A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643.

B. Install vapor barrier under interior slabs on grade; lap sheet over footings and seal to foundation walls.

C. Lap joints minimum 6 inches.

D. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.

E. No penetration of vapor barrier is allowed except for reinforcing steel and permanent utilities.

F. Repair damaged vapor retarder before covering with other materials.

END OF SECTION

SECTION 03 3000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:
   1. Section 31 20 00 "Earth Moving" for drainage fill under slabs-on-grade.
   2. Section 32 13 13 "Concrete Paving" for concrete pavement and walks.

1.03 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.04 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
      a. Contractor's superintendent.
      b. Independent testing agency responsible for concrete design mixtures.
      c. Ready-mix concrete manufacturer.
      d. Concrete Subcontractor.
      e. Special concrete finish Subcontractor.
   2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, methods for achieving specified floor and slab flatness and levelness, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
   1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
   1. Location of construction joints is subject to approval of the Architect.

E. Samples: For vapor retarder.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, manufacturer.

B. Welding certificates.

C. Material Certificates: For each of the following, signed by manufacturers:
   1. Cementitious materials.
   2. Admixtures.
   3. Form materials and form-release agents.
   4. Steel reinforcement and accessories.
   5. Curing compounds.
   6. Floor and slab treatments.
   7. Bonding agents.
   8. Adhesives.
   9. Vapor retarders.
   10. Joint-filler strips.
   11. Repair materials.

D. Material Test Reports: For the following, from a qualified testing agency:
   1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

F. Field quality-control reports.

G. Minutes of preinstallation conference.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
   1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
   1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
   2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M.

1.08 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

1.10 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
   2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:
   1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
   2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.01 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
   1. ACI 301.
   2. ACI 117.

2.02 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
   1. Plywood, metal, or other approved panel materials.
   2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
      a. High-density overlay, Class 1 or better.
      b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
      c. Structural 1, B-B or better; mill oiled and edge sealed.
      d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
   3. Overlaid Finnish birch plywood.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.

E. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

F. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

G. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
   1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

H. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
   1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
   2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
   3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.03 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Plain-Steel Wire: ASTM A 1064/A 1064M.

C. Deformed-Steel Wire: ASTM A 1064/A 1064M.

D. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.

E. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.

2.04 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
   1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.05 CONCRETE MATERIALS

A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

B. Cementitious Materials:
   1. Portland Cement: ASTM C 150/C 150M, Type I or Type II.
   2. Fly Ash: ASTM C 618, Class F.
   3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
   4. Silica Fume: ASTM C 1240, amorphous silica.

C. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 1N normal weight coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
   1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
   2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Lightweight Aggregate: ASTM C 330/C 330M, 3/4-inch nominal maximum aggregate size.

E. Air-Entraining Admixture: ASTM C 260/C 260M.

F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
   1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
   2. Retarding Admixture: ASTM C 494/C 494M, Type B.
   3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
   4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
   5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
   6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

G. Water: ASTM C 94/C 94M and potable.

2.06 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Carlisle Coatings & Waterproofing, Inc.; Blackline 400.
      b. Fortifiber Building Systems Group; Moistop Ultra 15.
      c. Grace Construction Products, W. R. Grace & Co.; Florprufe 120.
      d. Insulation Solutions, Inc.; Viper VaporCheck 16.
      e. Meadows, W. R., Inc.; Perminator 15 mil.
      f. Raven Industries Inc.; Vapor Block 15.
      g. Reef Industries, Inc.; Griffolyn 15 mil Green.
      h. Stego Industries, LLC; Stego Wrap 15 mil Class A.

B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

C. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch sieve, 10 to 30 percent passing a No. 100 sieve, and at least 5 percent passing No. 200 sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

2.07 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Anti-Hydro International, Inc.; AH Clear Cure WB.
      b. BASF Construction Chemicals - Building Systems; Kure-N-Seal WB.
      c. ChemMasters; Safe-Cure & Seal 20.
      d. Conspec by Dayton Superior; Cure and Seal WB.
      e. Cresset Chemical Company; Crete-Trete 309-VOC Cure & Seal.
      f. Dayton Superior Corporation; Safe Cure and Seal (J-18).
      g. Edoco by Dayton Superior; Spartan Cote WB II.
      h. Euclid Chemical Company (The), an RPM company; Aqua Cure VOX; Clearseal WB 150.
      i. Kaufman Products, Inc.; Cure & Seal 309 Emulsion.
      j. Lambert Corporation; Glazecote Sealer-20.
      k. L&M Construction Chemicals, Inc.; Dress & Seal WB.
      l. Meadows, W. R., Inc.; Vocomp-20.
      m. Metalcrete Industries; Metcure.

n. Nox-Crete Products Group; Cure & Seal 150E.
o. Symons by Dayton Superior; Cure & Seal 18 Percent E.
p. TK Products, Division of Sierra Corporation; TK-2519 WB.
q. Vexcon Chemicals, Inc.; Starseal 309.

F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 25 percent solids, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
1. Products: Subject to compliance with requirements, provide one of the following:
a. BASF Construction Chemicals - Building Systems; Kure-N-Seal W.
b. ChemMasters; Safe-Cure Clear.
c. Conspec by Dayton Superior; High Seal.
d. Dayton Superior Corporation; Safe Cure and Seal (J-19).
e. Edoco by Dayton Superior; Spartan Cote WB II 20 Percent.
f. Euclid Chemical Company (The), an RPM company; Diamond Clear VOX; Clearseal WB STD.
g. Kaufman Products, Inc.; SureCure Emulsion.
h. Lambert Corporation; Glazecote Sealer-20.
i. L&M Construction Chemicals, Inc.; Dress & Seal WB.
j. Meadows, W. R., Inc.; Vocomp-20.
k. Metalcrete Industries; Metcure 0800.
l. Nox-Crete Products Group; Cure & Seal 200E.
m. Symons by Dayton Superior; Cure & Seal 18 Percent E.
n. Vexcon Chemicals, Inc.; Starseal 0800.

2.08 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

B. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
1. Types I and II, nonload bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

D. Reglets: Fabricate reglets of not less than 0.022-inch-thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

E. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.09 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4,500 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
   1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
   2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
   4. Compressive Strength: Not less than 6,000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.10 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
   1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

C. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
   1. Fly Ash: 25 percent.
   2. Combined Fly Ash and Pozzolan: 25 percent.
   3. Slag Cement: 50 percent.
   4. Combined Fly Ash or Pozzolan and Slag Cement: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
   5. Silica Fume: 10 percent.
   6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
   7. Combined Fly Ash or Pozzolans, Slag Cement, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

D. Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
   2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
   3. Use water-reducing admixture in pumped concrete, concrete for parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.

2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Pile Caps, Grade Beams, Tie Beams and Foundations: Normal-weight concrete.
   1. Minimum Compressive Strength: As indicated at 28 days.
   2. Maximum W/C Ratio: 0.45.
   3. Slump Limit: 5 inches, plus or minus 1 inch.
   4. Air Content: Non-air entrained.

B. Slabs-on-Grade: Normal-weight concrete.
   1. Minimum Compressive Strength: As Indicated at 28 days.
   2. Maximum W/C Ratio: 0.45.
   3. Slump Limit: 5 inches, plus or minus 1 inch.
   4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

C. Walls: Normal-weight concrete.
   1. Minimum Compressive Strength: As indicated at 28 days.

2. Maximum W/C Ratio: 0.45.
3. Slump Limit: 5 inches or 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
4. Air Content: 5 percent, plus or minus 1.5 percent at point of delivery for 3/4 inch nominal maximum aggregate size.

D. Suspended Slabs: Lightweight concrete.
1. Minimum Compressive Strength: As indicated at 28 days.
2. Calculated Equilibrium Unit Weight: 115 lb/cu. ft., plus or minus 3 lb/cu. ft. as determined by ASTM C 567/C 567M.
3. Slump Limit: 5 inches or 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.12 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.13 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 FORMWORK INSTALLATION

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
1. Class A, 1/8 inch] for smooth-formed finished surfaces exposed to view.
2. Class C, 1/2 inchfor rough-formed finished surfaces not exposed to view.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.02 EMBEDDED ITEM INSTALLATION

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
   2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
   3. Install dovetail anchor slots in concrete structures as indicated.

3.03 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
   1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
   2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.04 VAPOR-RETARDER INSTALLATION

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
   1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.05 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
   1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
   1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.06 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
   1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
   2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
   3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
   4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
   5. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
   1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
   2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
      a. Comply with the Soff-Cut International, Inc.'s instruction for the SOFF-CUT System.
         1) Hand-troweled, burnished finish: Install cuts 0 to 2 hours after final finish at each joint location.
         2) Broom, burlap finish: Install cuts at each control joint location as soon as concrete will support weight of saw and operator without disturbing final finish.
         3) Cut depth not less than 10 percent of slab thickness with a 1-inch minimum.
         4) Remove debris in path of cut and under Skid Plate before cutting. Skid Plate must remain flat on surface.
         5) Use SOFF-CUT blades and Skid Plates, using a new Skid Plate with each new blade.
         6) Install SOFF-CUT joint protector at saw-cut intersection prior to cross-cut.
         7) Remove dry powder without disturbing finish.
         8) Avoid traffic across saw cut until sufficient strength is gained to protect joint edges.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
   1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
   2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
   3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.07 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
   1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
   1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
   2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
   3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
   1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   2. Maintain reinforcement in position on chairs during concrete placement.
   3. Screed slab surfaces with a straightedge and strike off to correct elevations.
   4. Slope surfaces uniformly to drains where required.
   5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.08 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
   1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
   1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where indicated:
   1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix 1 part portland cement to 1-1/2 parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix 1 part portland cement and 1 part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.09 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
1. Apply scratch finish to surfaces indicated and to receive concrete floor toppings or to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
1. Apply float finish to surfaces indicated to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system
2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
    a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
    b. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for suspended slabs.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated and where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom.
1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

G. Slip-Resistive Finish: Before final floating, apply slip-resistive finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:
   1. Uniformly spread 25 lb/100 sq. ft. of dampened slip-resistive silica aggregate over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.
   2. After broadcasting and tamping, apply float finish.
   3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aggregate.

3.10 MISCELLANEOUS CONCRETE ITEM INSTALLATION

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:
   1. Coordinate sizes and locations of concrete bases with actual equipment provided.
   2. Construct concrete (housekeeping pad) bases as indicated high unless otherwise indicated and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
   3. Minimum Compressive Strength: 4000 psi at 28 days.
   4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
   5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
   6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.11 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305.1 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

a. Water.
b. Continuous water-fog spray.
c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
   a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
   b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
   c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
   a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.12 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
   1. Defer joint filling until concrete has aged at least one (1) month. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

3.13 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
   1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
   2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before

proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
   1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
   2. After concrete has cured at least 14 days, correct high areas by grinding.
   3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
   4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
   5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

   6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
   7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.14 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:
   1. Steel reinforcement placement.
   2. Steel reinforcement welding.
   3. Headed bolts and studs.
   4. Verification of use of required design mixture.
   5. Concrete placement, including conveying and depositing.
   6. Curing procedures and maintenance of curing temperature.

7. Verification of concrete strength before removal of shores and forms from beams and slabs.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:
   1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
   2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
      a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
   3. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
   4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   5. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
   6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

   7. Compression Test Specimens: ASTM C 31.
      a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
      b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
   8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
      a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
      b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
   9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
   10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
   11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
   12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
   13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency

may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.

14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

E. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

END OF SECTION

SECTION 04 2000
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete block.
B. Clay facing brick.
C. Mortar and grout.
D. Reinforcement and anchorage.
E. Flashings.
F. Lintels.
G. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.
C. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2016.
D. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.
E. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2018.
F. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2016a.
G. ASTM C91/C91M - Standard Specification for Masonry Cement; 2012.
H. ASTM C140/C140M - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units; 2017a.
I. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2017.
J. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.
K. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).
L. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2017a.
M. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.
N. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2011.
O. ASTM C476 - Standard Specification for Grout for Masonry; 2018.
P. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2016.
Q. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.
R. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls; 2017.
S. BIA Technical Notes No. 28B - Brick Veneer/Steel Stud Walls; 2005.
T. BIA Technical Notes No. 46 - Maintenance of Brick Masonry; 2017.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

C. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

D. Test Reports: Concrete masonry manufacturer's test reports for units with integral water repellent admixture.

1.06 MOCK-UP

A. Construct a masonry wall as a mock-up panel sized 8 feet long by 6 feet high; include mortar, accessories, structural backup, and flashings (with lap joint, corner, and end dam) in mock-up.

B. Locate where directed.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:
   1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
   2. Load-Bearing Units: ASTM C90, lightweight.
      a. Hollow block, as indicated.
      b. Exposed Faces: Manufacturer's standard color and texture where indicated.

2.02 BRICK UNITS

A. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.
   1. Color and texture: Interstate Brick , 2 1/4" Modular, cored and solid units. Color: Pewter.
   2. Nominal size: 2 1/4" x 3 5/8" x 7 5/8".
   3. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.
   4. Compressive strength: As indicated on drawings, measured in accordance with ASTM C67/C67M.

2.03 MORTAR AND GROUT MATERIALS

A. Masonry Cement: ASTM C91/C91M, Type S.
   1. Colored Mortar: Premixed cement as required to match Architect's color sample.

B. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.

C. Hydrated Lime: ASTM C207, Type S.

D. Grout Aggregate: ASTM C404.

E. Water: Clean and potable.

F. Integral Water Repellent Admixture for Mortar: Polymeric liquid admixture added to mortar at the time of manufacture.
   1. Use only in combination with masonry units manufactured with integral water repellent admixture.
   2. Use only water repellent admixture for mortar from the same manufacturer as water repellent admixture in masonry units.

3. Meet or exceed performance specified for water repellent admixture used in masonry units.

2.04 REINFORCEMENT AND ANCHORAGE

A. Multiple Wythe Joint Reinforcement: ASTM A951/A951M.

B. Adjustable Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
   1. Type: Ladder, with adjustable ties or tabs spaced at 16 in on center.
   2. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M, Class B.
   3. Size: 0.1875 inch side rods with 0.1483 inch cross rods and adjustable components of 0.1875 inchwire, width of components as required to provide not less than 5/8 inch of mortar coverage from each masonry face.

C. Strap Anchors: Bent steel shapes, 1-1/2 inch width, 0.105 inch thick, 24 inch length, with 1-1/2 inch long, 90 degree bend at each end to form a U or Z shape or with cross pins, hot dip galvanized to ASTM A153/A153M, Class B.

2.05 FLASHINGS

A. Combination Non-Asphaltic Flashing Materials - Copper:

B. Flashing Sealant/Adhesives: Silicone, polyurethane, or silyl-terminated polyether/polyurethane or other type required or recommended by flashing manufacturer; type capable of adhering to type of flashing used.

C. Termination Bars: Stainless steel; compatible with membrane and adhesives.

D. Drip Edge: Stainless steel; angled drip with hemmed edge; compatible with membrane and adhesives.

E. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

2.06 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.

B. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.

C. Weeps:
   1. Type: Polyester mesh.

D. Cavity Vents:
   1. Type: Extruded propylene with honeycomb design.

E. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.07 LINTELS

A. Prefabricated Steel Lintels: Galvanized (G 90)

2.08 MORTAR AND GROUT MIXING

A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
   1. Masonry below grade and in contact with earth: Type S.
   2. Exterior, loadbearing masonry: Type S.
   3. Exterior, non-loadbearing masonry: Type S.

B. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.

C. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

D. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.

E. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COLD AND HOT WEATHER REQUIREMENTS

A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.

B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

3.04 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:
   1. Bond: Running.
   2. Coursing: One unit and one mortar joint to equal 8 inches.
   3. Mortar Joints: Flush.

D. Brick Units:
   1. Bond: Running.
   2. Coursing: Three units and three mortar joints to equal 8 inches.
   3. Mortar Joints: Beveled.

3.05 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

D. Remove excess mortar and mortar smears as work progresses.

E. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.

F. Interlock intersections and external corners.

G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

I. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.

J. Isolate masonry partitions from vertical structural framing members with a control joint.

K. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.06 WEEPS/CAVITY VENTS

A. Install weeps in veneer and cavity walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

B. Install cavity vents in veneer and cavity walls at 32 inches on center horizontally below shelf angles and lintels and near top of walls.

3.07 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

3.08 REINFORCEMENT AND ANCHORAGE - GENERAL AND CAVITY WALL MASONRY

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 8 inches on center.

B. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch mortar cover on each side.

C. Lap joint reinforcement ends minimum 6 inches.

D. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches horizontally and 24 inches vertically.

3.09 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.

B. Terminate flashing up 8 inches minimum on vertical surface of backing:

C. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.

D. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

3.10 LINTELS

A. Install loose steel galvinized lintels over openings in brick masonry.

B. Install reinforced unit masonry lintels over openings in CMU walls.
   1. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
   2. Place and consolidate grout fill without displacing reinforcing.

C. Maintain minimum ____ inch bearing on each side of opening.

3.11 GROUTED COMPONENTS

A. Lap splices minimum 24 bar diameters.

B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

C. Place and consolidate grout fill without displacing reinforcing.

D. At bearing locations, fill masonry cores with grout for a minimum 8 inches either side of opening.

3.12 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

3.13 BUILT-IN WORK

A. As work progresses, install built-in metal door frames and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout.

3.14 CLEANING

A. Remove excess mortar and mortar droppings.

B. Clean soiled surfaces with cleaning solution.

3.15 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 04 7200
CAST STONE MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Architectural cast stone.

B. Units required are:
   1. Exterior wall units, including wall caps and sills.

1.02 RELATED REQUIREMENTS

A. Section 04 0511 - Mortar and Masonry Grout: Mortar for setting cast stone.

B. Section 04 2000 - Unit Masonry: Installation of cast stone in conjunction with masonry.

C. Section 07 9200 - Joint Sealants: Sealing joints indicated to be left open for sealant.

1.03 REFERENCE STANDARDS

A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).

B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.

C. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2016.

D. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2014.

E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.

F. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016, with Editorial Revision (2016).

G. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.

H. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.

I. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2017.

J. ASTM C642 - Standard Test Method for Density, Absorption, and Voids in Hardened Concrete; 2013.

K. ASTM C1364 - Standard Specification for Architectural Cast Stone; 2017.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Test results of cast stone components made previously by the manufacturer.

C. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.

D. Mortar Color Selection Samples.

E. Verification Samples: Pieces of actual cast stone components not less than 6 inches square, illustrating range of color and texture to be anticipated in components furnished for the project.

F. Source Quality Control Test Reports.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. A firm with a minimum of 5 years experience producing cast stone of types required for project.

2. Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.

B. Number each piece individually to match shop drawings and schedule.

C. Store cast stone components and installation materials in accordance with manufacturer's instructions.

D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.

E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.

F. Store mortar materials where contamination can be avoided.

G. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

PART 2 PRODUCTS

2.01 ARCHITECTURAL CAST STONE

A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural limestone, complying with ASTM C1364.
   1. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.
   2. Freeze-Thaw Resistance: Demonstrated by laboratory testing in accordance with ASTM C1364.
   3. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet.
   4. Color: Selected by Architect from manufacturer's full range.
   5. Remove cement film from exposed surfaces before packaging for shipment.

B. Shapes: Provide shapes indicated on drawings.
   1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch or length divided by 360, whichever is greater, but not more than 1/4 inch.
   2. Unless otherwise indicated on drawings, provide:
      a. Wash or slope of 1:12 on exterior horizontal surfaces.
      b. Drips on projecting components, wherever possible.
      c. Raised fillets at back of sills and at ends to be built in.

C. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI 318.

2.02 MATERIALS

A. Portland Cement: ASTM C150/C150M.
   1. For Mortar: Type I or II, except Type III may be used in cold weather.

B. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone.

C. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands.

D. Admixtures: ASTM C494/C494M.

E. Water: Potable.

F. Reinforcing Bars: ASTM A615/A615M deformed bars, galvanized.
   1. Galvanized in accordance with ASTM A767/A767M, Class I.

G. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, galvanized or ASTM A884/A884M, epoxy coated.

H. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.

I. Mortar: Portland cement-lime, as specified in Section 04 0511; do not use masonry cement.

J. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

2.03 SOURCE QUALITY CONTROL

A. Test compressive strength and absorption of specimens selected at random from plant production.
   1. Test in accordance with ASTM C642.
   2. Select specimens at rate of 3 per 500 cubic feet, with a minimum of 3 per production week.
   3. Submit reports of tests by independent testing agency, showing compliance with requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine construction to receive cast stone components. Notify Architect if construction is not acceptable.

B. Do not begin installation until unacceptable conditions have been corrected.

3.02 INSTALLATION

A. Install cast stone components in conjunction with masonry, complying with requirements of Section 04 2000.

B. Mechanically anchor cast stone units indicated; set remainder in mortar.

C. Setting:
   1. Drench cast stone components with clear, running water immediately before installation.
   2. Set units in a full bed of mortar unless otherwise indicated.
   3. Fill vertical joints with mortar.
   4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

3.03 TOLERANCES

A. Joints: Make all joints 3/8 inch, except as otherwise detailed.
   1. Rake mortar joints 3/4 inch for pointing.
   2. Remove excess mortar from face of stone before pointing joints.
   3. Point joints with mortar in layers 3/8 inch thick and tool to a slight concave profile.
   4. Leave the following joints open for sealant:
      a. Head joints in top courses, including copings, parapets, cornices, sills, and steps.
      b. Joints in projecting units.
      c. Joints between rigidly anchored units, including soffits, panels, and column covers.
      d. Joints below lugged sills and stair treads.
      e. Joints below ledge and relieving angles.
      f. Joints labeled "expansion joint".

B. Installation Tolerances:
   1. Variation from Plumb: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet or more.
   2. Variation from Level: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet, or 3/8 inch maximum.
   3. Variation in Joint Width: Not more than 1/8 inch in 36 inches or 1/4 of nominal joint width, whichever is less.

4. Variation in Plane Between Adjacent Surfaces (Lipping): Not more than 1/16 inch difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

3.04 REPAIR

A. Repair chips and other surface damage noticeable when viewed in direct daylight at 20 feet.

B. Repair with matching touch-up material provided by the manufacturer and in accordance with manufacturer's instructions.

C. Repair methods and results subject to Architect 's approval.

3.05 CLEANING

A. Keep cast stone components clean as work progresses.

B. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

3.06 PROTECTION

A. Protect completed work from damage.

B. Clean, repair, or restore damaged or mortar-splashed work to condition of new work.

END OF SECTION

SECTION 05 1200

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Structural steel.
   2. Field-installed shear connectors.
   3. Grout.

B. Related Requirements:
   1. Section 05 12 13 "Architecturally Exposed Structural Steel Framing" for additional requirements for architecturally exposed structural steel.
   2. Section 05 31 00 "Steel Decking" for field installation of shear connectors through deck.
   3. Section 05 50 00 "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame, miscellaneous steel fabrications and other steel items not defined as structural steel.
   4. Division 09 for coating requirements.

1.03 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.

C. Heavy Sections: Rolled and built-up sections as follows:
   1. Shapes included in ASTM A 6/A 6M with flanges thicker than 1-1/2 inches.
   2. Welded built-up members with plates thicker than 2 inches.
   3. Column base plates thicker than 2 inches.

D. Protected Zone: Structural members or portions of structural members indicated as "Protected Zone" on Drawings. Connections of structural and nonstructural elements to protected zones are limited.

E. Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Load-Resisting System and which are indicated as "Demand Critical" or "Seismic Critical" on Drawings.

1.04 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.05 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.06 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show fabrication of structural-steel components.
   1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
   2. Include embedment Drawings.
   3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
   4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
   5. Identify members and connections of the Seismic-Load-Resisting System.
   6. Indicate locations and dimensions of protected zones.
   7. Identify demand critical welds.

C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint qualified by testing, including the following:
   1. Power source (constant current or constant voltage).
   2. Electrode manufacturer and trade name, for demand critical welds.

D. Delegated-Design Submittal: For structural-steel connections indicated to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.07 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and fabricator.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Mill test reports for structural steel, including chemical and physical properties.

E. Product Test Reports: For the following:
   1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
   2. Direct-tension indicators.
   3. Tension-control, high-strength, bolt-nut-washer assemblies.
   4. Shear stud connectors.
   5. Shop primers.
   6. Nonshrink grout.

F. Source quality-control reports.

G. Field quality-control and special inspection reports.

1.08 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD, or is accredited by the IAS Fabricator Inspection Program for Structural Steel (AC 172).

B. Installer Qualifications: An installer specializing in performing the work of this section with minimum five (5) years of documented experience including involvement in not less than three (3) projects of similar, or greater, size and complexity and maintains a quality control program in accordance with AISC 360, Chapter N.

C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P1 or to SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

E. Comply with applicable provisions of the following specifications and documents:
   1. AISC 303.
   2. AISC 341 and AISC 341s1.
   3. AISC 360.
   4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.09 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
   1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
   1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
   2. Clean and relubricate bolts and nuts that become dry or rusty before use.
   3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 3125/F 3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated.
   1. Select and complete connections using schematic details indicated and AISC 360.
   2. Use Allowable Stress Design; data are given at service-load level.

B. Moment Connections: Type FR, fully restrained.

C. Construction: Combined system of moment frame, braced frame, and shear walls.

2.02 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992 or ASTM A 572, Grade 50.

B. Channels, Angles-Shapes: ASTM A 36 or ASTM A 572, Grade 50.

C. Plate and Bar: ASTM A 36 or ASTM A 572, Grade 50.

D. Corrosion-Resisting Structural-Steel Shapes, Plates, and Bars: ASTM A 588, Grade 50.

E. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B or Grade C, structural tubing.

F. Corrosion-Resisting, Cold-Formed Hollow Structural Sections: ASTM A 847/A 847M, structural tubing.

G. Steel Pipe: ASTM A 53, Type E or Type S, Grade B.
   1. Weight Class: Standard, unless noted otherwise.
   2. Finish: Black except where indicated to be galvanized.

H. Steel Castings: ASTM A 216, Grade WCB with supplementary requirement S11.

I. Steel Forgings: ASTM A 668.

J. Welding Electrodes: Comply with AWS requirements.

2.03 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM F 3125, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.
   1. Direct-Tension Indicators: ASTM F 959, Type 325-1, compressible-washer type with plain finish.

B. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM F 3125, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.
   1. Finish: Hot-dip zinc coating.
   2. Direct-Tension Indicators: ASTM F 959, Type 325-1, compressible-washer type with mechanically deposited zinc coating finish.

C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 3125, Grade F1852, Type 1, heavy-hex head assemblies consisting of steel structural bolts with splined ends; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.
   1. Finish: Plain.

D. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.

E. Unheaded Anchor Rods: ASTM F 1554, Grade 36, unless noted otherwise.
   1. Configuration: Straight.
   2. Nuts: ASTM A 563 heavy-hex carbon steel.
   3. Plate Washers: ASTM A 36 carbon steel.
   4. Washers: ASTM F 436, Type 1, hardened carbon steel.
   5. Finish: Plain.

F. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.
   1. Nuts: ASTM A 563 heavy-hex carbon steel.
   2. Plate Washers: ASTM A 36 carbon steel.
   3. Washers: ASTM F 436, Type 1, hardened carbon steel.
   4. Finish: Plain.

G. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.

H. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.

2.04 PRIMER

A. Primer: SSPC-Paint 25, Type II, zinc oxide, alkyd, linseed oil primer.

B. Galvanizing Repair Paint: ASTM A 780.

2.05 GROUT

A. Metallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.

B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.06 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
   1. Camber structural-steel members where indicated.
   2. Fabricate beams with rolling camber up.
   3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.

4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning."

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

G. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural-steel frame. Straighten as required to provide uniform, square, and true members in completed wall framing. Build up welded framing, weld exposed joints continuously, and grind smooth.

H. Welded Door Frames: Build up welded door frames attached to structural-steel frame. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk machine screws, uniformly spaced not more than 10 inches o.c. unless otherwise indicated.

I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.07 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.08 SHOP PRIMING

A. Shop prime steel surfaces except the following:
1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces of high-strength bolted, slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.
6. Surfaces enclosed in interior construction.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
1. SSPC-SP 2, "Hand Tool Cleaning."
2. SSPC-SP 3, "Power Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
   2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.09 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123.
   1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
   2. Galvanize lintels attached to structural-steel frame and located in exterior walls.

2.10 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.
   1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Bolted Connections: Inspect and test shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1and the following inspection procedures, at testing agency's option:
   1. Liquid Penetrant Inspection: ASTM E 165.
   2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
   3. Ultrasonic Inspection: ASTM E 164.
   4. Radiographic Inspection: ASTM E 94.

D. In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
   1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
   2. Conduct tests according to requirements in AWS D1.1 on additional shear connectors if weld fracture occurs on shear connectors already tested.

E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
   1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
   1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.03 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Baseplates, Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
   1. Set plates for structural members on wedges, shims, or setting nuts as required.
   2. Weld plate washers to top of baseplate.
   3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
   4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
   1. Level and plumb individual members of structure.
   2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.04 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
   1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
   1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
   2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
   3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.05 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
   1. Verify structural-steel materials and inspect steel frame joint details.
   2. Verify weld materials and inspect welds.
   3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Bolted Connections: Inspect and test bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.
   1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
      a. Liquid Penetrant Inspection: ASTM E 165.
      b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
      c. Ultrasonic Inspection: ASTM E 164.
      d. Radiographic Inspection: ASTM E 94.
   2. Test 10% of all field welds along with weld gage measurement; test 20% of all full and partial penetration welds.

E. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
   1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
   2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

F. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.06 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780/A 780M.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

END OF SECTION

SECTION 05 2100

STEEL JOIST FRAMING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. K-series steel joists.
   2. KCS-type K-series steel joists.
   3. K-series steel joist substitutes.
   4. LH- and DLH-series long-span steel joists.
   5. Joist girders.
   6. Joist accessories.

B. Related Requirements:
   1. Section 03 30 00 "Cast-in-Place Concrete" for installing bearing plates in concrete.
   2. Section 04 20 00 "Unit Masonry" for installing bearing plates in unit masonry.
   3. Section 05 12 00 "Structural Steel Framing" for field-welded shear connectors.

1.03 DEFINITIONS

A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."

B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.04 ACTION SUBMITTALS

A. Product Data: For each type of joist, accessory, and product.

B. Shop Drawings:
   1. Include layout, designation, number, type, location, and spacing of joists.
   2. Include joining and anchorage details; bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
   3. Indicate locations and details of bearing plates to be embedded in other construction.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Welding certificates.

C. Manufacturer certificates.

D. Mill Certificates: For each type of bolt.

E. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.

F. Field quality-control reports.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."
   1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.

B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications."

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.08 SEQUENCING

A. Deliver steel bearing plates to be built into masonry construction.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.
   1. Use ASD; data are given at service-load level.
   2. Design special joists to withstand design loads with live-load deflections no greater than the following:
      a. Floor Joists: Vertical deflection of 1/240 of the span.
      b. Roof Joists: Vertical deflection of 1/360 of the span.

2.02 K-SERIES STEEL JOISTS

A. Manufacture steel joists of type indicated according to "Standard Specification for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.
   1. Joist Type: K-series steel joists and KCS-type K-series steel joists.

B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.

C. Provide holes in chord members for connecting and securing other construction to joists.

D. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."

E. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."

F. Camber joists according to SJI's "Specifications."

G. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.03 LONG-SPAN STEEL JOISTS

A. Manufacture steel joists according to "Standard Specification for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as follows:
   1. Joist Type: LH-series steel joists and DLH-series steel joists.
   2. End Arrangement: Underslung.
   3. Top-Chord Arrangement: Parallel.

B. Provide holes in chord members for connecting and securing other construction to joists.

C. Camber long-span steel joists according to SJI's "Specifications."

D. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.04 JOIST GIRDERS

A. Manufacture joist girders according to "Standard Specification for Joist Girders" in SJI's "Specifications," with steel-angle top- and bottom-chord members; with end and top-chord arrangements as follows:
   1. End Arrangement: Underslung with bottom-chord extensions.
   2. Top-Chord Arrangement: Parallel.

B. Provide holes in chord members for connecting and securing other construction to joist girders.

C. Camber joist girders according to SJI's "Specifications."

D. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.05 PRIMERS

A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15, unless noted otherwise in Division 9 specifications.

2.06 JOIST ACCESSORIES

A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.

B. Bridging: Schematically indicated. Detail and fabricate according to SJI's "Specifications." Furnish additional erection bridging if required for stability.

C. Bridging: Fabricate as indicated and according to SJI's "Specifications." Furnish additional erection bridging if required for stability.

D. Fabricate steel bearing plates from ASTM A 36/A 36M steel with integral anchorages of sizes and thicknesses indicated. Hot-dip zinc coat according to ASTM A 123/A 123M.

E. Steel bearing plates with integral anchorages are specified in Section 055000 "Metal Fabrications."

F. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface unless otherwise indicated.
   1. Finish: Plain, uncoated.

G. High-Strength Bolts, Nuts, and Washers: ASTM F 3125, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.
   1. Finish: Hot-dipped galvanized.

H. Welding Electrodes: Comply with AWS standards.

I. Galvanizing Repair Paint: ASTM A 780/A 780M.

J. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.07 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.

B. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.

C. Apply one coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.

D. Shop priming of joists and joist accessories is specified in Division 09 specifications.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing 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.

3.02 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written instructions, and requirements in this Section.
   1. Before installation, splice joists delivered to Project site in more than one piece.
   2. Space, adjust, and align joists accurately in location before permanently fastening.
   3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
   4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.

C. Field weld joists to supporting steel bearing plates. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Weld joists to supporting steel framework or bolt using carbon-steel bolts.

E. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.03 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Visually inspect field welds according to AWS D1.1/D1.1M.
   1. In addition to visual inspection, test field welds according to AWS D1.1/D1.1M and the following procedures, at testing agency's option:
      a. Liquid Penetrant Inspection: ASTM E 165/E 165M.
      b. Magnetic Particle Inspection: ASTM E 709.
      c. Ultrasonic Testing: ASTM E 164.
      d. Radiographic Testing: ASTM E 94.

C. Visually inspect bolted connections.

D. Prepare test and inspection reports.

3.04 PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories.
   1. Clean and prepare surfaces by hand-tool cleaning according to SSPC-SP 2 or power-tool cleaning according to SSPC-SP 3.
   2. Apply a compatible primer of same type as primer used on adjacent surfaces.

END OF SECTION

SECTION 05 3100

STEEL DECKING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Roof deck.
   2. Composite floor deck.
   3. Noncomposite form deck.

B. Related Requirements:
   1. Section 03 30 00 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
   2. Section 05 12 00 "Structural Steel Framing" for shop- and field-welded shear connectors.
   3. Section 05 50 00 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings:
   1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.04 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of steel deck.

C. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
   1. Power-actuated mechanical fasteners.
   2. Acoustical roof deck.

D. Evaluation Reports: For steel deck, from ICC-ES.

E. Field quality-control reports.

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
   1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.02 ROOF DECK

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Steel Deck:
      a. ASC Profiles, Inc.
      b. Canam Steel Corp.;The Canam Manac Group.
      c. Consolidated Systems, Inc.
      d. DACS, Inc.
      e. Epic Metals Corporation.
      f. Marlyn Steel Decks, Inc.
      g. New Millennium Building Systems, LLC.
      h. Nucor Corp.; Vulcraft Division.
      i. Roof Deck, Inc.
      j. United Steel Deck, Inc.
      k. Valley Joist; Division of EBSCO Industries, Inc.
      l. Verco Manufacturing Co.
      m. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
   1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G90 zinc coating.
   2. Deck Profile: As indicated.
   3. Profile Depth: As indicated.
   4. Design Uncoated-Steel Thickness: As indicated.
   5. Span Condition: Triple span or more.
   6. Side Laps: Overlapped.

2.03 COMPOSITE FLOOR DECK

A. Composite Steel Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 30, with the minimum section properties indicated, and with the following:
   1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 50, G90 zinc coating.
   2. Profile Depth: As indicated.
   3. Design Uncoated-Steel Thickness: As indicated.
   4. Span Condition: Double span or more.

2.04 NONCOMPOSITE FORM DECK

A. Noncomposite Form Deck: Fabricate ribbed-steel sheet noncomposite form-deck panels to comply with "SDI Specifications and Commentary for Noncomposite Steel Form Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
   1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 60, G90zinc coating.
   2. Profile Depth: As indicated.

3. Design Uncoated-Steel Thickness: As indicated.
4. Span Condition: Double span or more.

2.05 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws, as indicated.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, diameter as indicated.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.

I. Galvanizing Repair Paint: ASTM A 780.

J. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine supporting frame and field 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.

3.02 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
   1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.03 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members mechanical fasteners, as follows. Puddle welding is prohibited.
   1. Mechanically fasten with Hilti X-HSN 24 powder actuated fasteners installed in compliance with ICC ESR 2197 or equivalent by other manufacturers, based on base steel thickness between 1/8” and 3/8”.
   2. Each sheet shall be fastened to each support at each edge and interior ribs of deck units and across the width of the sheet at intervals not exceeding patterns as shown on the drawings.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-third of the span or 16 inches, unless noted otherwise, and as follows:
   1. Mechanically fasten with self-drilling, No. 12 diameter or larger, carbon-steel screws.
   2. Or mechanically fasten with HILTI S-SLC-01 M HWH or HILTI S-SLC-2 M HWH screws.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
   1. End Joints: Lapped 2 inches minimum.

D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Mechanically fasten to substrate to provide a complete deck installation.
   1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

E. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.04 FLOOR-DECK INSTALLATION

A. Fasten floor-deck panels to steel supporting members by mechanical fasteners as follows:
   1. Mechanically fasten with Hilti X-HSN 24 powder actuated fasteners installed in compliance with ICC ESR 2197 or equivalent by other manufacturers, based on base steel thickness.
   2. Each sheet shall have edge ribs of panels fastened to each support and additional fasteners not less than a 36/4 pattern as a minimum and as shown on the drawings.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 24 inches, and as follows:
   1. Mechanically fasten with self-drilling, No. 12 diameter or larger, carbon-steel screws.
   2. Or mechanically fasten with HILTI S-SLC-01 M HWH or HILTI S-SLC-2 M HWH screws.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
   1. End Joints: Lapped.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.05 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Field welds will be subject to inspection.

C. Prepare test and inspection reports.

3.06 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 05 4000

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Non-load bearing formed steel stud exterior wall framing.

B. Non-load bearing formed steel stud interior wall framing.

C. Soffit framing.

D. Exterior wall sheathing.

1.02 RELATED REQUIREMENTS

A. Section 07 21 00 - Thermal Insulation for insulation on exterior of steel studs.

B. Section 07 21 19 - Foamed-In Place Insulation at CMU cavity walls.

C. Section 055000 "Metal Fabrications" for miscellaneous steel shapes, masonry shelf angles, and connections used with cold-formed metal framing.

1.03 REFERENCE STANDARDS

A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2012

B. AISI S200-12 - North American Specification for the Design of Cold-Formed Steel Framing – General Provisions; 2012

C. AISI S21 -07 w/ S1-12 (2012): North American Standard for Cold-Formed Steel Framing - Wall Stud Design, 2007 Edition With Supplement 1 (Reaffirmed 2012)

D. AISI S212-07 (2012): North American Standard for Cold-Formed Steel Framing – Header Design, 2007 Edition (Reaffirmed 2012)

E. AISI S213-07 w/ S1-09 (2012): North American Standard for Cold-Formed Steel Framing – Lateral Design, 2007 Edition With Supplement 1 (Reaffirmed 2012)

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2012.

D. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2013b.

E. ASTM C955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases; 2013c.

F. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2011a.

G. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.

H. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).

1.04 SUBMITTALS

A. Shop Drawings: Indicate component details, framed openings, and accessories or items required of related work.

1. Indicate stud layout. Shop drawings shall include an erection plan, and wall sections coordinated with the Architectural Contract Drawings along with anchorage and connection details for all light gauge steel framing shown on the Contract Drawings.
2. Describe method for securing studs to tracks and for bolted framing connections. All connections shall be clearly detailed on the shop drawings.
3. Provide structural calculations for loadings, analysis and design of specially fabricated framing that have been stamped by a Professional Structural Engineer licensed in the State of North Carolina. Structural calculations shall be for all light gage cold formed framing members including studs for brick veneer, lintels at head of all openings, sills, jambs, tracks and all connections of members. Connection details to structural steel framing shall allow for deflection of structural steel framing.

B. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention.

C. Delegated-Design Submittal: For cold-formed steel framing.

D. Calculations and shop drawings must be approved in writing by the Architect before work can begin.

1.05 INFORMATIONAL SUBMITTALS

A. Coordinate "Qualification Data" Paragraph below with qualification requirements in Section 014000 "Quality Requirements" and as may be supplemented in "Quality Assurance" Article.

B. Qualification Data: For testing agency.

C. Product Certificates: For each type of code-compliance certification for studs and tracks.

D. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.
1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips
7. Miscellaneous structural clips and accessories.

E. Evaluation Reports: For nonstandard cold-formed steel framing and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.06 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice and registered in the state of North Carolina and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

C. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

D. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment, indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

E. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud

Association, the Steel Framing Industry Association, or the Steel Stud Manufacturers Association.

F. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:
   1. ClarkDietrich Building Systems: www.clarkdietrich.com.
   2. MarinoWare; a Division of Ware Industries: www.marinoware.com.
   3. The Steel Network, Inc: www.SteelNetwork.com.

B. Framing Connectors and Accessories:
   1. Same manufacturer as metal framing.

C. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer to design cold-formed steel framing.

B. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
   1. Design Loads: As indicated.
   2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
      a. Interior Non-Load-Bearing Wall Framing: Horizontal deflection of 1/240 of the wall height under a horizontal load of 5 lbf/sq. ft.
      b. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 (lower wall studs) and 1/240 (2nd & 3rd floor wall studs) of the wall height.
   3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
   4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
      a. Upward and downward movement of 3/4 inch.
   5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

C. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.02 FRAMING SYSTEM

A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

B. Design Criteria: Provide completed framing system having the following characteristics:
   1. Design: Calculate structural characteristics of cold-formed steel framing members according to AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
   2. Structural Performance: Design, engineer, fabricate, and erect to withstand specified design loads for project conditions within required limits.
   3. Design Loads: In accordance with applicable codes.
   4. Live load deflection meeting the following, unless otherwise indicated:
   5. Able to tolerate movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
   6. Able to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

2.03 FRAMING MATERIALS

A. Studs and Track: ASTM A1003, Structural Grade, Type H, metallic coated studs formed to channel, "C", or "Sigma" shape with punched web; U-shaped track in matching nominal width and compatible height.
   1. Gage and depth: As required to meet specified structural performance levels.
   2. Galvanized in accordance with ASTM A653/A653M and ASTM A1003/A1003M G90/Z275 coating.

B. Framing Connectors: Factory-made, formed steel sheet.
   1. Material: ASTM A653/A653M, Grade 50, Class 1 or 2 and ASTM A1003/A1003M SS Grade 33 and 40 (minimum), with G90/Z275 hot dipped galvanized coating for thicknesses less than 10 gage (0.118 inch) (3 mm), and factory punched holes and slots as required by structural performance.
   2. Structural Performance: Maintain load and movement capacity required by applicable code, when evaluated in accordance with AISI North American Specification for the Design of Cold Formed Steel Structural Members.
   3. Movement Connections: Provide mechanical anchorage devices (vertical deflection clips) that accommodate movement using slotted holes, shouldered screws or screws and anti-friction or stepped bushings, while maintaining structural performance of framing. Provide movement connections where indicated on drawings.
      a. Where continuous studs bypass elevated floor slab, connect stud to slab in manner allowing vertical and horizontal movement of slab without affecting studs; allow for minimum movement of 1/2 inch (13 mm).
      b. Where top of stud wall terminates below structural floor or roof, connect studs to structure in manner allowing vertical and horizontal movement of slab without affecting studs; allow for minimum movement of 1/2 inch (13 mm).
   4. Fixed Connections: Provide non-movement connections for tie-down to foundation, floor-to-floor tie-down, roof-to-wall tie-down, joist hangers, gusset plates, and stiffeners.

2.04 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0538 inch.
   2. Flange Width: 2 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0677 inch.

2. Flange Width: 1-1/2 inches.

C. Vertical Deflection Clips: Manufacturer's standard bypass and head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   Dietrich Metal Framing; a Worthington Industries Company.
   a. ClarkDietrich Building Systems: www.clarkdietrich.com.
   b. MarinoWare; a Division of Ware Industries: www.marinoware.com.
   c. The Steel Network, Inc: www.SteelNetwork.com.

2.05 INTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0428 inch.
   2. Flange Width: 1-5/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: Matching steel studs..
   2. Flange Width: 1-1/4 inches.

C. Vertical Deflection Clips: Manufacturer's standard bypass and head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. ClarkDietrich Building Systems: www.clarkdietrich.com.
      b. MarinoWare; a Division of Ware Industries: www.marinoware.com.
      c. The Steel Network, Inc: www.SteelNetwork.com.

2.06 SOFFIT FRAMING

A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0329 inch.
   2. Flange Width: 1-5/8 inches, minimum.

2.07 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
   1. Supplementary framing.
   2. Bracing, bridging, and solid blocking.
   3. Web stiffeners.
   4. Anchor clips.
   5. End clips.
   6. Foundation clips.
   7. Gusset plates.
   8. Stud kickers and knee braces.
   9. Joist hangers and end closures.
   10. Hole-reinforcing plates.
   11. Backer plates.

2.08 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36, zinc coated by hot-dip process according to ASTM A 123.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts, carbon-steel nuts, and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153, Class C.

C. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
   1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

2.09 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780.

B. Cement Grout: Portland cement, ASTM C 150/C 150M, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C 1107/C 1107M, and with a fluid consistency and 30-minute working time.

D. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.

E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

2.10 WALL SHEATHING

A. Gypsum Sheathing Board:
   1. Application: Exterior sheathing, unless otherwise indicated.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D 3273.
   3. Glass-Mat-Faced Sheathing: Glass mat faced gypsum substrate as defined in ASTM C 1177/C 1177M.
   4. Core Type: Regular.
   5. Regular Board Thickness: 5/8 inch (16 mm).
   6. Edges: Square, for vertical application.
   7. Glass-Mat-Faced Products:
      a. CertainTeed Corporation; GlasRoc Brand.
      b. Georgia-Pacific Gypsum LLC; DensGlass Gold Sheathing.
      c. National Gypsum Company; Gold Bond Brand e2XP Extended Exposure Sheathing.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

2.11 ACCESSORIES

A. Bracing, Furring, Bridging Anchor Ledges and Angles: Formed sheet steel and anchorages, thickness determined for conditions encountered; finish to match framing components.

B. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.12 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
   1. Fabricate framing assemblies using jigs or templates.
   2. Cut framing members by sawing or shearing; do not torch cut.

3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
    a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.
4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.

C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet and as follows:
1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Examine substrates, areas, conditions, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that required to obtain fire-resistance ratings indicated. Protect remaining fire-resistive materials from damage.

C. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.03 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
    a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Include details on Drawings showing expansion-joint construction and locations.

H. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

I. Install insulation, specified in Section 072100 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

J. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.04 EXTERIOR & INTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks, sized to match studs. Align floor and ceiling tracks with wall layout. Secure in place with fasteners at maximum 24 inches (600 mm) oc. Coordinate installation of sealant with floor and ceiling tracks.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
    1. Stud Spacing: As indicated on Shop Drawings.

C. Construct corners using minimum of three studs. Install minimum double studs at wall openings, door and window jambs unless calculations indicate more are required.

D. Install studs full length in one piece. Splicing of studs is not permitted.

E. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
    1. Connect vertical deflection clips to bypassing studs and anchor to building structure.

F. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

G. Touch-up field welds and damaged galvanized surfaces with primer.

H. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

I. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
    1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
    2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
    3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

J. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.05 FRAMING ACCESSORY INSTALLATION

A. Install accessories as required by structural design calculations. Provide appropriate fasteners in all predrilled holes backed by another framing member.
   1. Bridging Clip for Cold Rolled Channel Bridging: Secure to stud web by inserting tabs through web slots. Secure to channel with one screw.

3.06 WALL SHEATHING

A. Wall Sheathing: Secure with long dimension parallel to wall studs, with ends over firm bearing and staggered, using self-tapping screws.
   1. Exterior Glass Mat Faced Sheathing Taping: Use fiberglass joint tape, bedded and finished with chemical hardening type joint compound.

3.07 ERECTION TOLERANCES

A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
   1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.08 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.09 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 05 5000

METAL FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Steel framing and supports for mechanical and electrical equipment.
   2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
   3. Shelf angles.
   4. Loose bearing and leveling plates for applications where they are not specified in other Sections.

B. Products furnished, but not installed, under this Section include the following:
   1. Loose steel lintels.
   2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
   3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Requirements:
   1. Section 03 30 00 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
   2. Section 04 20 00 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
   3. Section 05 12 00 "Structural Steel Framing."

1.02 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.03 ACTION SUBMITTALS

A. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
   1. Steel framing and supports for mechanical and electrical equipment.
   2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
   3. Shelf angles.
   4. Loose steel lintels.

B. Delegated-Design Submittal: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.

C. Welding certificates.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

E. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.05 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

B. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1, "Structural Welding Code - Steel."

1.06 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ladders.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.02 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 316L.

D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 316L.

E. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

F. Rolled-Stainless-Steel Floor Plate: ASTM A 793.

G Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.

H. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

2.03 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36, unless noted otherwise, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
   1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

D. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

E. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

f. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
   2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.04 MISCELLANEOUS MATERIALS

A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
   1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
   2. Provide weldable primer for structural steel members shown to require field welding of connections.

B. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.05 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply 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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

2.05 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

D. Galvanize all exposed exterior miscellaneous framing and supports and where indicated.

2.06 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch (19-mm) bolts, spaced not more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise indicated.
   1. Provide mitered and welded units at corners.
   2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches (50 mm) larger than expansion or control joint.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry.

C. Galvanize and prime shelf angles located in exterior walls.

2.07 METAL LADDERS

A. General:
   1. Comply with ANSI A14.3, except for elevator pit ladders.
   2. For elevator pit ladders, comply with ASME A17.1/CSA B44.

B. Steel Ladders:
   1. Space siderails 16 inches apart unless otherwise indicated.
   2. Siderails: Continuous, 3/8-by-2-1/2-inch steel flat bars, with eased edges.
   3. Rungs: 3/4-inch-diameter steel bars.
   4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
   5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
   6. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
   7. Galvanize and prime exterior ladders, including brackets.
   8. Provide security door with padlock hasp at foot of ladder to prevent unauthorized ladder use.

2.08 LADDER SAFETY CAGES

A. General:
   1. Fabricate ladder safety cages to comply with ANSI A14.3. Assemble by welding or with stainless-steel fasteners.
   2. Provide primary hoops at tops and bottoms of cages and spaced not more than 20 feet o.c. Provide secondary intermediate hoops spaced not more than 48 inches o.c. between primary hoops.

3. Fasten assembled safety cage to ladder rails and adjacent construction by welding or with stainless-steel fasteners unless otherwise indicated.

B. Steel Ladder Safety Cages:
1. Primary Hoops: 1/4-by-4-inch flat bar hoops.
2. Secondary Intermediate Hoops: 1/4-by-2-inch flat bar hoops.
3. Vertical Bars: 3/16-by-1-1/2-inch flat bars secured to each hoop.
4. Galvanize and prime ladder safety cages, including brackets and fasteners.

2.08 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize and prime exterior miscellaneous steel trim.

2.09 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates.

2.10 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches (200 mm) unless otherwise indicated.

C. Hot dip galvanize loose steel lintels located in exterior walls, then paint lintels once installed. Coordinate primer and finish coats to be compatible with hot-dip galvanization. Provide full range color palette for Architect to select final color.

2.11 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.12 FINISHES, GENERAL

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.12 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
   1. Shop prime with universal shop primer.

D. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 3, "Power Tool Cleaning." requirements indicated below:
   1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   3. Other Items: SSPC-SP 3, "Power Tool Cleaning."

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.02 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.03 INSTALLING BEARING AND LEVELING PLATES

A. Clean masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.04 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION

SECTION 05 5213
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted handrails.

B. Free-standing railings at exterior steps.

C. Courtroom railings and guardrails.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Placement of anchors in concrete.

B. Section 06 1000 - Rough Carpentry: Placement of blocking in stud wall construction.

C. Section 09 2116 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

D. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube; 2016.

E. ASTM B429/B429M - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube; 2010e1.

F. ASTM B483/B483M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Tubes for General Purpose Applications; 2013, with Editorial Revision (2014).

G. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

H. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications:

1. A company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.

B. Allow for expansion and contraction of members and building movement without damage to connections or members.

C. Dimensions: See drawings for configurations, material sizes and railing heights.

D. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
   1. For anchorage to concrete, provide inserts to be cast into concrete, or core drill to accept railing post. Grout railing post in position.
   2. For anchorage to stud walls, provide backing plates, for bolting anchors.

E. Provide mechanical and welding fittings where indicated to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.02 ALUMINUM MATERIALS

A. Aluminum Pipe: Schedule 40; ASTM B429/B429M, ASTM B241/B241M, or ASTM B483/B483M. Use in all exterior applications.

2.03 STEEL RAILING SYSTEM

A. Steel Tube: ASTM A500/A500M, Grade B cold-formed structural tubing.

B. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

C. Straight Splice Connectors: Steel welding collars.

D. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

E. Courtroom rail double acting gate hardware: McMaster- Carr two-way swinging door hinge , zinc plated finish Part # 1479A12

2.04 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

D. Welded Joints:
   1. Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
   2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
   3. 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.

2.05 ALUMINUM FINISHES

A. Superior Performance Organic Coating System: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system.

B. Color: To be selected by Architect from manufacturer's standard line.

C. Touch-Up Materials: As recommended by coating manufacturer for field application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

B. Apply one coat of bituminous paint to concealed aluminum surfaces that will be in contact with cementitious or dissimilar materials.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Install railings in compliance with ADA Standards for accessible design at applicable locations.

D. Anchor railings securely to structure.

E. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

3.05 SCHEDULE

A. Courtroom railings: Tubular steel railing system, primed and painted finish.

B. Exterior Stairs and ramp: Aluminum pipe railings, high performance organic finish.

END OF SECTION

SECTION 05 7500
DECORATIVE FORMED METAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior fabrications made of formed metal sheet, secondary supports, and anchors to structure, including:
   1. Factory fabricated column covers.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

B. ASTM A449 - Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use; 2014.

C. ASTM D523 - Standard Test Method for Specular Gloss; 2014.

D. ASTM D1781 - Standard Test Method for Climbing Drum Peel for Adhesives; 1998 (Reapproved 2012).

E. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics; 2016.

F. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates; 2016.

G. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films; 2007 (Reapproved 2015).

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

I. NAAMM AMP 500-06 - Metal Finishes Manual; 2006.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Show layout and elevations, dimensions and thickness of panels, connections, details and location of joints, sealants and gaskets, method of anchorage, number of anchors, supports, reinforcement, trim, flashings, and accessories.
   1. Differentiate between shop and field fabrication.
   2. Indicate substrates and adjacent work with which the fabrications must be coordinated.
   3. Include large-scale details of anchorages and connecting elements.
   4. Include large-scale details or schematic, exploded or isometric diagrams to fully explain flashing at a scale of not less than _____ inches per _____ inches.

C. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

D. Maintenance Data: Care of finishes and warranty requirements.

E. Executed Warranty: Submit warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating products specified in this section.
   1. With not less than three years of documented experience.
   2. Approved by MCM sheet manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.

1. Protect finishes by applying heavy duty removable plastic film during production.
2. Package for protection against transportation damage.
3. Provide markings to identify components consistently with drawings.
4. Exercise care in unloading, storing and installing panels to prevent bending, warping, twisting and surface damage.

B. Store products protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
1. Store in well ventilated space out of direct sunlight.
2. Protect from moisture and condensation with tarpaulins or other suitable weather tight covering installed to provide ventilation.
3. Store at a slope to ensure positive drainage of any accumulated water.
4. Do not store in any enclosed space where ambient temperature can exceed 120 degrees F.
5. Avoid contact with any other materials that might cause staining, denting, or other surface damage.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. MCM Sheet Manufacturer's Finish Warranty: Provide manufacturer's written warranty stating that the finish will perform as follows for minimum of 5 years:
1. Chalking: No more than that represented by a No.8 rating based on ASTM D4214.
2. Color Retention: No fading or color change in excess of 5 Hunter color difference units, calculated in accordance with ASTM D2244.
3. Gloss Retention: Minimum of 30 percent gloss retention, when tested in accordance with ASTM D523.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Factory Fabricated Column Covers:
1. ATAS International, Inc; ____: www.atas.com/#sle.
2. DAMS Incorporated; ____: www.damsinc.com/#sle.
3. SAF Metal Fabrication, a division of Southern Aluminum Finishing Company, Inc; ____: www.saf.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.02 FORMED METAL FABRICATIONS - GENERAL

A. Shop Assembly: Preassemble items to greatest extent possible. Minimize field splices and field assembly. Disassemble only as necessary for transportation and handling. Mark items clearly for assembly and installation.

B. Coordination: Match dimensions and attachment of formed metal items to adjacent construction. Produce integrated assemblies. Closely fit joints; align edges and flat surfaces unless indicated otherwise.

C. Forming: Profiles indicated. Maximize lengths. Fold exposed edges to form hem indicated or ease edges to radius indicated with concealed stiffener. Provide flat, flush surfaces without cracking or grain separation at bends.

D. Reinforcement: Increase metal thickness; use concealed stiffeners, backing materials or both. Provide stretcher leveled standard of flatness and stiffness required to maintain flatness and hold adjacent items in flush alignment.

E. Anchors: Straps, plates and anchors as required to support and anchor items to adjacent construction.

F. Supports: Miscellaneous framing, mounting, clips, sleeves, fasteners and accessories required for installation.

G. Welding and Brazing: Weld or braze joints continuously. Grind, fill or dress to produce smooth, flush, exposed surfaces. Do not discolor metal. Grind smooth, polish, and restore damaged finishes to required condition.

2.03 FACTORY FABRICATED COLUMN COVERS

A. Factory Fabricated Column Covers: Factory fabricated and factory finished, MCM column covers, mechanically fastened to structural support.
   1. Material: Manufacturer's standard MCM sheet.
   2. MCM Sheet Thickness: 0.24 inch core.
   3. Column Section Length: 12 feet, maximum, between horizontal joints.
   4. Horizontal Reveals: Top and bottom.
   5. Fasteners: Self-drilling; ASTM A449 heat treated steel, with manufacturer's standard corrosion resistant coating.
   6. Aluminum Finish: Manufacturer's standard factory applied PVDF coating.
   7. Color: To be selected by Architect from manufacturer's standard range.

2.04 MATERIALS

A. General: Provide sheet metal without pitting, seam marks, roller marks, stains, discolorations, or other imperfections exposed to view on finished units.

B. Metal Composite Material (MCM) Sheet: Two sheets of aluminum sandwiching a solid core of extruded thermoplastic material formed in a continuous process with no glues or adhesives between dissimilar materials; core material free of voids and spaces; no foamed insulation material content.
   1. Overall Sheet Thickness: 6 mm.
   2. Face Sheet Thickness: 0.19 inches, minimum.
   3. Alloy: Manufacturer's standard, selected for best appearance and finish durability.
   4. Bond and Peel Strength: No adhesive failure of the bond between the core and the skin nor cohesive failure of the core itself below 22.4 inch-pound/inch with no degradation in bond performance, when tested in accordance with ASTM D1781, simulating resistance to panel delamination, after 8 hours of submersion in boiling water and after 21 days of immersion in water at 70 degrees F.
   5. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
   6. Flammability: Self-ignition temperature of 650 degrees F or greater, when tested in accordance with ASTM D1929.

2.05 FINISHES

A. Finishes, General: Comply with NAAMM AMP 500-06.
   1. Complete mechanical finishes before fabrication. After fabrication, finish joints, bends, abrasions and surface blemishes to match sheet.
   2. Protect mechanical finishes on exposed surfaces from damage.
   3. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.
   4. Appearance: Limit variations in appearance of adjacent to one-half the range represented in approved samples. Noticeable variations in the same piece are not acceptable. Install components within the range of approved samples to minimize contrast.

B. Aluminum Finishes:
   1. High Performance Organic Coatings: AAMA 2604; multiple coats, thermally cured fluoropolymer system.
   2. Color: To be selected by Architect from manufacturer's full range.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and interfaces with other work.

B. Verify substrate on-site to determine that conditions are acceptable for product installation in accordance with manufacturer's written instructions.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

D. Notify Architect in writing of conditions detrimental to proper and timely completion of work. Do not proceed with erection until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Protect adjacent work areas and finish surfaces from damage during installation.

3.03 INSTALLATION - MCM FABRICATIONS

A. Do not install products that are defective, including warped, bowed, dented, and broken members, and members with damaged finishes.

B. Comply with instructions and recommendations of MCM sheet manufacturer and fabricator, and with approved shop drawings.

C. Install securely allowing for necessary thermal and structural movement; comply with fabricator's instructions for installation of concealed fasteners.

D. Do not handle or tool products during erection in manner that damages finish, decreases strength, or results in visual imperfection or failure in performance. Return component parts that require alteration to shop for refabrication, if possible, or for replacement with new parts.

E. Do not form panels in field unless required by fabricator and approved by the Architect; comply with MCM sheet manufacturer's instructions and recommendations for field forming.

F. Separate dissimilar metals; use gasket fasteners, isolation shims, or isolation tape where needed to eliminate possibility of electrolytic action between metals.

G. Install square, plumb, straight, and true, accurately fitted, with tight joints and intersections maintaining the following installation tolerances:
   1. Variation From Plane or Location: 1/2 inch in 30 feet of length and up to 3/4 inch in 300 feet, maximum.
   2. Deviation of Vertical Member From True Line: 1/8 inch in 25 feet run, maximum.
   3. Deviation of Horizontal Member From True Line: 1/8 inch in 25 feet run, maximum.
   4. Offset From True Alignment Between Two Adjacent Members Abutting End To End, In Line: 1/32 inch, maximum.

H. Replace damaged products.

3.04 CLEANING

A. Restore finishes damaged during installation and construction period. Return items that cannot be refinished in the field to manufacturer or fabricator. Refinish entire unit or provide new units.

B. Remove protective film after installation of joint sealers, after cleaning of adjacent materials, and immediately prior to completion of work.

C. Remove temporary coverings and protection of adjacent work areas.

D. Clean installed products in accordance with manufacturer's instructions.

3.05 PROTECTION

A. Protect installed products from damage during construction.

END OF SECTION

SECTION 06 1000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rough opening framing for doors, windows, and roof openings.

B. Subflooring.

C. Roofing nailers.

D. Roofing cant strips.

E. Preservative treated wood materials.

F. Fire retardant treated wood materials.

G. Communications and electrical room mounting boards.

H. Concealed wood blocking, nailers, and supports.

I. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications: Miscellaneous steel connectors, support angles, and Knee wall bracing chanels.

B. Section 07 7200 - Roof Accessories: Prefabricated roof curbs.

1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

B. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2017).

C. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.

D. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing; 2018a.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

F. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2016a.

G. AWPA U1 - Use Category System: User Specification for Treated Wood; 2017.

H. PS 1 - Structural Plywood; 2009.

I. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.

J. PS 20 - American Softwood Lumber Standard; 2015.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide technical data on wood preservative materials.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
   2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

B. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Sizes: Nominal sizes as indicated on drawings, S4S.

B. Moisture Content: Kiln-dry or MC15.

C. Stud Framing (2 by 2 through 2 by 6):
   1. Species: Any allowed under referenced grading rules.
   2. Grade: No. 2.

D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

A. Subflooring: Structural cementitious subfloor panels.
   1. Size: 48 inches wide nominal, by 96 inches long, nominal.
   2. Thickness: 3/4 inch, nominal.
   3. Edges: Square along width; tongue and groove along length.
   4. Span: 16 inches, maximum.
   5. Fire Resistance: Noncombustible, when tested in accordance with ASTM E136.
   6. Surface Burning Characteristics: Flame spread index of 0; smoke-developed Index of 0; when tested in accordance with ASTM E84.
   7. Mold Resistance: Rating of 10, when tested in accordance with ASTM D3273.
   8. Manufacturers:
      a. USG Corporation; USG Structural Panel Concrete Subfloor: www.usg.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

B. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.04 ACCESSORIES

A. Fasteners and Anchors:
   1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

B. Subfloor Adhesives: Waterproof, air cure type, cartridge dispensed; adhesives designed for subfloor applications and complying with either ASTM C557 or ASTM D3498.
   1. Manufacturers:
      a. Franklin International, Inc; Titebond PROvantage Weatherproof Subfloor Adhesive: www.titebond.com/#sle.
      b. Huber Engineered Woods, LLC; AdvanTech Subfloor Adhesive: www.huberwood.com/#sle.
      c. Liquid Nails, a brand of PPG Architectural Coatings; LN-902 Subfloor and Deck Construction Adhesive, 10 oz: www.liquidnails.com/#sle.
      d. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.05 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire Retardant Treatment:
   1. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
      a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
      b. Treat rough carpentry items as indicated .
      c. Do not use fire retardant treated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Treatment:
   1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
      a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
      b. Treat lumber exposed to weather.
      c. Treat lumber in contact with roofing, flashing, or waterproofing.
      d. Treat lumber in contact with masonry or concrete.
      e. Treat lumber less than 18 inches above grade.
      f. Treat lumber in other locations as indicated.

PART 3 EXECUTION

3.01 PREPARATION

A. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

C. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

D. Provide the following specific non-structural framing and blocking:
   1. Cabinets and shelf supports.
   2. Wall brackets.
   3. Handrails.
   4. Grab bars.
   5. Towel and bath accessories.

6. Wall-mounted door stops.
7. Chalkboards and marker boards.
8. Wall paneling and trim.

3.04 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

B. Provide wood curb at all roof openings except where prefabricated curbs are specified and where specifically indicated otherwise. Form corners by alternating lapping side members.

3.05 INSTALLATION OF CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
   1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   3. Install adjacent boards without gaps.

END OF SECTION

SECTION 06 2000
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

B. Wood base, casings and moldings.

C. Railing caps

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 06 4100 - Architectural Wood Casework: Shop fabricated custom cabinet work.

C. Section 06 4200 - Wood Paneling: Shop fabricated custom paneling.

1.03 REFERENCE STANDARDS

A. AWI (QCP) - Quality Certification Program; current edition at www.awiqcp.org.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2017).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with installation of associated and adjacent components.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data:
   1. Provide manufacturer's product data, storage and handling instructions for factory-fabricated units.

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
   2. Include certification program label.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
   2. Single Source Responsibility: Provide and install this work from single fabricator.

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.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.

B. Protect from moisture damage.

C. 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) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Interior Woodwork Items:
   1. Moldings, Bases, Casings, and Miscellaneous Trim: Clear white pine; prepare for paint finish.
   2. Handrails: Clear white oak; prepare for stained finish.

2.02 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.03 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.04 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

D. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 1, Lacquer, Nitrocellulose.
      b. Stain: As selected by Architect.
      c. Sheen: Flat.
   2. Opaque:
      a. System - 1, Lacquer, Nitrocellulose.
      b. Color: As selected by Architect.
      c. Sheen: Flat.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.03 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06 4100
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Hardware.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 12 3600 - Countertops.

1.03 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2017).

C. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2016.

D. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

C. Product Data: Provide data for hardware accessories.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.06 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 CABINETS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Wood Veneer Faced Cabinet:
   1. Exposed Surfaces: HPVA HP-1 Grade A, Red Oak, quarter cut, random-matched.
   2. Semi-Exposed Surfaces: HPVA HP-1 Grade B, Red Oak, plain sliced, random-matched.
   3. Concealed Surfaces: Manufacturer's option.

C. Plastic Laminate Faced Cabinets: Custom grade.

D. Breakroom Cabinets: Plastic laminate faced, Custom grade.

E. Cabinets at Restrooms and Break Areas:
   1. Cabinet Style: Flush overlay.
   2. Cabinet Doors and Drawer Fronts: Flush style.
   3. Drawer Side Construction: Multiple-dovetailed.
   4. Drawer Construction Technique: Dovetail joints.

2.02 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

B. Hardwood Edgebanding: Use solid hardwood edgebanding matching species, color, grain, and grade for exposed portions of cabinetry.

2.03 LAMINATE MATERIALS

A. Manufacturers:
   1. Formica Corporation; ____: www.formica.com/#sle.
   2. Panolam Industries International, Inc; Nevamar Standard HPL: www.panolam.com/#sle.
   3. Wilsonart LLC; ____: www.wilsonart.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

2.04 COUNTERTOPS

A. Countertops are specified in Section 12 3600.

2.05 ACCESSORIES

A. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
   1. Color: As selected by Architect from manufacturer's full range.

B. Vinyl Countertop Edge: PVC anchor type tee-molding edging in width to match thickness of countertop, color match laminate color , used at all locations.

C. Fasteners: Size and type to suit application.

D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

E. Grommets: Standard plastic, painted metal, or rubber grommets for cut-outs, in color to match adjacent surface.

2.06 HARDWARE

A. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, polished chrome finish, for nominal 1 inch spacing adjustments.

B. Drawer and Door Pulls: "U" shaped wire pull, steel with chrome finish, 4 inch centers.

C. Drawer Slides:
   1. Type: Extension types as indicated.
   2. Static Load Capacity: Commercial grade.
   3. Mounting: Side mounted.

D. Hinges: European style concealed self-closing type, steel with polished finish.

2.07 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

E. Mechanically fasten back splash to countertops as recommended by laminate manufacturer at 16 inches on center.

F. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

2.08 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. On items to receive transparent finishes, use wood filler matching or blending with surrounding surfaces and of types recommended for applied finishes.

C. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 1, Lacquer, Nitrocellulose.
      b. Stain: As selected by Architect.
      c. Sheen: Satin.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

C. Use concealed joint fasteners to align and secure adjoining cabinet units.

3.03 ADJUSTING

A. Adjust installed work.

B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 06 4200
WOOD PANELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Custom wood veneer paneling.

B. Shop finishing.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Grounds and concealed blocking.

1.03 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2017).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

C. Samples: Submit two samples of finished plywood, 4 x 4 inch in size, illustrating wood grain and specified finish.

D. Samples: Submit two samples of wood trim, ____ inch long.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect work from moisture damage.

B. Do not deliver wood materials to project site until building is fully enclosed and interior temperature and humidity are in accordance with recommendations of AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

PART 2 PRODUCTS

2.01 PANELING

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless otherwise indicated.

B. Flat Paneling:
   1. Species: Red Oak.
   2. Cut: Plain.
   3. Panels: Veneer of full width and balanced sequence matched.
      a. Panels More Than One Leaf High: Panel end matching.
      b. Each Panel Within Single Area: Full width premanufactured sets.
   4. Visible Edges and Reveals: Filled and painted.
   5. Outside Corners: Mitered and splined.

2.02 WOOD-BASED MATERIALS - GENERAL

A. Wood fabricated from old growth timber is not permitted.

B. Provide sustainably harvested wood, certified or labeled as specified in Section 01 6000.

2.03 ADHESIVES AND FASTENERS

A. Adhesives: Type suitable for intended purpose, complying with applicable air quality regulations.

2.04 FABRICATION

A. Prepare panels for delivery to site, permitting passage through building openings.

B. Finish exposed edges of panels as specified by grade requirements.

2.05 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

D. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 12, Polyurethane, Water-based.
      b. Stain: As selected by Architect.
      c. Sheen: Satin.

2.06 ACCESSORIES

A. Lumber for Shimming, Blocking, and _____: Softwood lumber of _____ species.

B. Wood Filler: Tinted to match surface finish color.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated on shop drawings.

B. Verify adequacy of backing and support framing.

C. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Do not begin installation until wood materials have been fully acclimated to interior conditions.

C. Set and secure materials and components in place, plumb and level, using concealed fasteners wherever possible.

D. Where necessary to cut and fit on site, scribe work abutting other components. Do not use additional overlay trim to conceal gaps.

E. Touch up damaged finish to match original, using materials provided by fabricator; replace components that cannot be refinished like new.

3.03 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 07 0150.19

PREPARATION FOR ROOFING REPAIR

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Partial replacement of existing roofing system in preparation for replacement roofing system in designated areas as indicated on drawings.

B. Removal of existing flashing and counterflashings.

C. Temporary roofing protection.

1.02 RELATED REQUIREMENTS

A. Section 07 5100 - Built-Up Bituminous Roofing Repair.

B. Section 07 6200 - Sheet Metal Flashing and Trim: Replacement of flashing and counterflashings.

1.03 REFERENCE STANDARDS

A. ASTM D2178/D2178M - Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing; 2015a.

B. ASTM D312/D312M - Standard Specification for Asphalt Used in Roofing; 2016a.

C. ASTM D41/D41M - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing; 2011 (Reapproved 2016).

D. ASTM D4601/D4601M - Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing; 2004, with Editorial Revision (2012).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with affected mechanical and electrical work associated with roof penetrations.

B. Preinstallation Meeting: Convene one week before starting work of this section.
   1. Attendees:
      a. Architect.
      b. Contractor.
      c. Owner.
      d. Installer.
      e. Roofing system manufacturer's field representative.
      f. Inspection and Testing Agency Representatives.
   2. Meeting Agenda: Provide agenda to participants prior to meeting in preparation for discussions on the following:
      a. Removal and installation schedule.
      b. Necessary preparatory work.
      c. Protection before, during, and after roofing system installation.
      d. Removal of existing roofing system.
      e. Installation of new roofing system.
      f. Temporary roofing and daily terminations.
      g. Transitions and connection to and with other work.
      h. Inspections and testing of installed systems.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit for each type of material.

C. Installer's Qualification Statement.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1. When same installer as new roofing system, comply with related requirements of section indicated for new roofing system.
2. Approved by existing roofing system warrantor to work on existing warranted roof system.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

1.08 FIELD CONDITIONS

A. Existing Roofing System: Built-up asphalt roofing.

B. Do not remove existing roofing membrane when weather conditions threaten the integrity of building contents or intended continued occupancy.

C. Maintain continuous temporary protection prior to and during installation of new roofing system.

D. Provide notice at least three days before starting activities that will affect normal building operations.

E. Owner will occupy building areas directly below re-roofing area.
1. Provide Owner with at least 48 hours written notice of roofing activities that may affect their operations and to allow them to prepare for upcoming activities as necessary.
2. Do not disrupt Owner's operations or activities.
3. Maintain access of Owner's personnel to corridors, existing walkways, and adjacent buildings.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Existing Warranties: Perform this work using methods and materials that will maintain existing roof system warranties.
1. Notify existing roof system warrantor prior to starting this work and obtain written instructions for procedures necessary to maintain this existing warranty.
2. Upon completion of this work, notify warrantor of reroofing completion and obtain documentation to verify that existing roofing system has been inspected and warranty is still in effect.
a. Submit documentation upon project closeout.

PART 2 PRODUCTS

2.01 COMPONENTS

A. Refer to following sections for additional information on components relating to this work:
1. Partial removal of existing roofing system in preparation for new roofing system in designated areas as indicated on drawings, refer to Section 07 5100.
2. Remove existing flashing and counterflashings in preparation for replacement of these materials as part of this work, refer to Section 07 6200 for material requirements.

2.02 MATERIALS

A. Patching Materials: Provide necessary materials in accordance with requirements of existing roofing system.

B. Temporary Roofing Protection Materials:
1. Contractor's responsibility to select appropriate materials for temporary protection of roofing areas as determined necessary for this work.

C. Roofing Recover Materials:
1. Contractor's responsibility to select appropriate materials for roofing re-cover as determined necessary for this work.

2.03 ACCESSORIES

A. Fasteners: Type and size as required and compatible with existing and new roofing system to resist local wind uplift.

B. Base Sheet: Non-perforated, asphalt-coated glass fiber base sheet, Type II in accordance with ASTM D4601/D4601M.

C. Glass Fiber Felt: Asphalt-impregnated, glass fiber felt, Type IV in accordance with ASTM D2178/D2178M.

D. Asphalt Primer: Apply to concrete decking in preparation for temporary roofing, Type II in accordance with ASTM D41/D41M.

E. Roofing Asphalt: Type III or Type IV, in accordance with ASTM D312/D312M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing roof surface has been cleared of materials being removed from existing roofing system and ready for next phase of work as required.

3.02 PREPARATION

A. Sweep roof surface clean of loose matter.

B. Remove loose refuse and dispose of properly off-site.

3.03 MATERIAL REMOVAL

A. Remove only existing roofing materials that can be replaced with new materials as the weather will permit.

B. Remove metal counter flashings. Reinstall following membrane re work.

3.04 INSTALLATION

A. Coordinate scope of this work with requirements for installation of new roofing system, refer to Section 07 5100 for additional requirements.

3.05 PROTECTION

A. Provide protection of existing roofing system that is not having work performed on it.

B. Provide temporary protective sheeting over uncovered deck surfaces.

C. Provide for surface drainage from sheeting to existing drainage facilities.

3.06 SCHEDULES

A. Existing Roofing Areas as Indicated: Remove existing perimeter flashings, base flashings, counter flashings, and roofing membrane.

B. Remove roof mounted mechanical equipment and electrical equipment as indicated on drawings.

END OF SECTION

SECTION 07 2100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation at cavity wall construction, exterior wall behind stucco wall finish, and continuous over all exterior wall sheathing .

B. Batt insulation in exterior and interior wall construction.

C. Batt insulation and foamed in place insulation for filling perimeter window and door shim spaces.

1.02 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry: Masonry wall reinforcing and veneers ties with insulation securing features.

B. Section 05 4000 - Cold-Formed Metal Framing:

C. Section 07 2500 - Weather Barriers: Separate air barrier and vapor retarder materials.

D. Section 07 5400 - Thermoplastic Membrane Roofing: Insulation specified as part of roofing system.

E. Section 07 8400 - Firestopping: Insulation as part of fire-rated through-penetration assemblies.

F. Section 09 2116 - Gypsum Board Assemblies: Gypsum sheathing, Acoustic insulation inside walls and partitions and Accoustical joint treatment.

1.03 REFERENCE STANDARDS

A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2018.

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

D. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2016a.

E. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies; 2017.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.

B. Insulation Inside Masonry Cavity Walls: Extruded polystyrene (XPS) board.

C. Insulation Over Exterior Sheathing Continuous: EIFS system refer to spec section 07 2400

D. Insulation in Metal Framed Walls: Batt insulation with no vapor retarder.

2.02 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene (XPS) Cavity Wall Insulation Board: Complies with ASTM C578, and manufactured using carbon black technology.
   1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   3. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88), minimum, per 1 inch thickness at 75 degrees F mean temperature.
   4. Board Size: 15-3/4 inch by 96 inch.
   5. Board Thickness: 2-3/16 inch.
   6. Board Edges: Square.

2.03 BATT INSULATION MATERIALS

A. Where batt insulation is indicated in exterior walls, either glass fiber or mineral fiber batt insulation may be used, at Contractor's option. Where sound attenuation is required in interior partitions mineral fiber batt insulation shall be used.

B. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
   1. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
   2. Formaldehyde Content: Zero.
   3. Thermal Resistance: R-value of 19.
   4. Manufacturers:
      a. CertainTeed Corporation; _____: www.certainteed.com/#sle.
      b. Johns Manville; _____: www.jm.com/#sle.
      c. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

C. Mineral Fiber Sound Attenuation Insulation: Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
   1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
   3. Thickness: 3 inch.
   4. Manufacturers:
      a. Knauf Insulation; EcoBatt Insulation: www.knaufinsulation.com/#sle.
      b. Thermafiber, Inc; SAFB: www.thermafiber.com/#sle.
      c. ROCKWOOL (ROXUL, Inc); AFB Evo™: www.rockwool.com/#sle.
      d. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.04 ACCESSORIES

A. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, or irregularities.

3.02 BOARD INSTALLATION AT CAVITY WALLS

A. Following application of liquid applied weatehr barrier, secure to exterior face of CMU using two piece wall reinforcing and insulation retaining clips as specified in unit masonry spec section 04 2000:

B. Install boards to fit snugly between wall ties.

C. Install boards horizontally on walls.

D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BATT INSTALLATION

A. Install insulation in accordance with manufacturer's instructions.

B. Install in wall stud spaces without gaps or voids. Do not compress insulation.

C. Install in boxed header framing.

D. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

E. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

F. Coordinate work of this section with construction of air barrier seal specified in Section 07 2500.

3.04 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 2400
EXTERIOR INSULATION AND FINISH SYSTEMS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 07 6200 - Sheet Metal Flashing and Trim: Perimeter flashings.

1.02 REFERENCE STANDARDS

A. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2016.

B. ASTM C297/C297M - Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions; 2015.

C. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2018.

D. ASTM C1397 - Standard Practice for Application of Class PB Exterior Insulation and Finish Systems (EIFS) and EIFS with Drainage; 2013.

E. ASTM D968 - Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive; 2005 (Reapproved 2010).

F. ASTM D2247 - Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity; 2011.

G. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.

H. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).

I. ASTM E2273 - Standard Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish Systems (EIFS) Clad Wall Assemblies; 2003 (reapproved 2011).

J. ASTM E2486/E2486M - Standard Test Method for Impact Resistance of Class PB and PI Exterior Insulation and Finish Systems (EIFS); 2013 (Reapproved 2018).

K. ASTM G153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013.

L. ASTM G155 - Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013.

M. ICC-ES AC219 - Acceptance Criteria for Exterior Insulation and Finish Systems; 2009, with Editorial Revision (2014).

N. NFPA 259 - Standard Test Method for Potential Heat of Building Materials; 2013.

O. NFPA 268 - Standard Test Method for Determining Ignitibility of Exterior Wall Assemblies Using a Radiant Heat Energy Source; 2012.

P. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components; 2012.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on system materials, product characteristics, performance criteria, and system limitations.

C. Shop Drawings: Indicate wall joint patterns, joint details, and molding profiles.

1.04 QUALITY ASSURANCE

A. Maintain copy of specified installation standard and manufacturer's installation instructions at project site during installation.

B. EIFS Manufacturer Qualifications: Provide EIFS products other than insulation from the same manufacturer with qualifications as follows:
   1. Member in good standing of EIMA (EIFS Industry Members Association).

2. Manufacturer of EIFS products for not less than 5 years.

1.05 FIELD CONDITIONS

A. Do not prepare materials or apply EIFS under conditions other than those described in the manufacturer's written instructions.

B. Do not prepare materials or apply EIFS during inclement weather unless areas of installation are protected. Protect installed EIFS areas from inclement weather until dry.

C. Do not install coatings or sealants when ambient temperature is below 40 degrees F.

D. Do not leave installed insulation board exposed to sunlight for extended periods of time.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's standard material warranty, covering a period of not less than 5 years.

PART 2 PRODUCTS

2.01 EXTERIOR INSULATION AND FINISH SYSTEM

A. Exterior Insulation and Finish System: DRAINAGE type; reinforced finish coating on flat-backed insulation board adhesive-applied directly to water-resistive coating over substrate; provide a complete system that has been tested to show compliance with the following characteristics; include all components of specified system and substrate(s) in tested samples.

B. Fire Characteristics:
   1. Flammability: Pass, when tested in accordance with NFPA 285.
   2. Ignitibility: No sustained flaming when tested in accordance with NFPA 268.
   3. Potential Heat of Foam Plastic Insulation Tested Independently of Assembly: No portion of the assembly having potential heat that exceeds that of the insulation sample tested for flammability (above), when tested in accordance with NFPA 259 with results expressed in Btu per square foot.

C. Adhesion of Water-Resistive Coating to Substrate: For each combination of coating and substrate, minimum flatwise tensile bond strength of 15 psi, when tested in accordance with ASTM C297/C297M.

D. Adhesion to Water-Resistive Coating: For each combination of insulation board and substrate, when tested in accordance with ASTM C297/C297M, maximum adhesive failure of 25 percent unless flatwise tensile bond strength exceeds 15 psi in all samples.

E. Water Penetration Resistance: No water penetration beyond the plane of the base coat/insulation board interface after 15 minutes, when tested in accordance with ASTM E331 at 6.24 psf differential pressure with tracer dye in the water spray; include in tested sample at least two vertical joints and one horizontal joint of same type to be used in construction; disassemble sample if necessary to determine extent of water penetration.

F. Drainage Efficiency: Average minimum efficiency of 90 percent, when tested in accordance with ASTM E2273 for 75 minutes.

G. Salt Spray Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating after 300 hours exposure in accordance with ASTM B117, using at least three samples matching intended assembly, at least 4 by 6 inches in size.

H. Freeze-Thaw Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating when viewed under 5x magnification after 10 cycles, when tested in accordance with ICC-ES AC 219 or 235.

I. Weathering Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating when viewed under 5x magnification after 2000 hours of accelerated weathering conducted in accordance with ASTM G153 Cycle 1 or ASTM G155 Cycle 1, 5, or 9.

J. Water Degradation Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating after 14 days exposure, when tested in accordance with ASTM D2247.

K. Mildew Resistance: No growth supported on finish coating during 28 day exposure period, when tested in accordance with ASTM D3273.

L. Abrasion Resistance Of Finish: No cracking, checking or loss of film integrity when tested in accordance with ASTM D968 with 500 liters of sand.

M. Impact Resistance: Construct system to provide the following impact resistance without exposure of broken reinforcing mesh, when tested in accordance with ASTM E2486/E2486M:
   1. Standard: 25 to 49 in-lb, for areas not indicated as requiring higher impact resistance.
   2. Medium: 50 to 89 in-lb, for At existing roof cornice modification..

2.02 MATERIALS

A. Finish Coating Top Coat: Water-based, air curing, acrylic or polymer-based finish with integral color and texture.
   1. Texture: Dryvit Systems, Inc, Standard Textures, with Dirt Pickup Resistance; Quarzputz DPR; www.dryvit.com/#sle.

B. Base Coat: Fiber-reinforced, acrylic or polymer-based product compatible with insulation board and reinforcing mesh.

C. Reinforcing Mesh: Balanced, open weave glass fiber fabric, treated for compatibility and improved bond with coating, weight, strength, and number of layers as required to meet required system impact rating.

D. Extruded Polystyrene (XPS) Board Insulation: Complies with ASTM C578, with natural skin surfaces.
   1. Board Size: 24 by 48 inch.
   2. Board Size Tolerance: 1/16 inch from square and dimension.
   3. Board Thickness: 2 inches.
   4. Dimensional Stability: 2 percent, maximum.
   5. Board Edges: Square.
   6. Type and Thermal Resistance, R-value (RSI-value): Type X, 5.0 (0.88) per 1 inch thickness at 75 degrees F mean temperature.
   7. Type and Compressive Resistance: Type X, 15 psi (104 kPa), minimum.
   8. Type and Water Absorption: Type X, 0.3 percent by volume, maximum, by total immersion.

E. Drainage Layer or Spacers: Furnished or approved by EIFS manufacturer; capable of achieving specified drainage rate; not required to be water-resistive, air retarder, or vapor retarder.

F. Water-Resistive Barrier Coating: Fluid-applied air and water barrier membrane; applied to sheathing; furnished or approved by EIFS manufacturer.

G. Flashing Tape: Self-adhering rubberized asphalt tape with polyethylene backing or other material and surface conditioner furnished or approved by EIFS manufacturer.

2.03 ACCESSORY MATERIALS

A. Insulation Adhesive: Type required by EIFS manufacturer for project substrate.

B. Metal Flashings: As specified in Section 07 6200.

C. Trim: EIFS manufacturer's standard PVC trim accessories, as required for a complete project and including starter track and drainage accessories.

D. Sealant Materials: Compatible with EIFS materials and as recommended by EIFS manufacturer.

PART 3 EXECUTION

3.01 GENERAL

3.02 INSTALLATION - GENERAL

A. Install in accordance with EIFS manufacturer's instructions and ASTM C1397.
   1. Where different requirements appear in either document, comply with the most stringent.
   2. Neither of these documents supercedes provisions of Contract Documents that defines contractual relationships between parties or scope of this work.

3.03 INSTALLATION - WATER-RESISTIVE BARRIER

A. Apply barrier coating as recommended by coating manufacturer; prime substrate as required before application.

B. Seal substrate transitions and intersections with other materials to form continuous water-resistive barrier on exterior of sheathing, using method recommended by manufacturer.

C. At door and window rough openings and other wall penetrations, seal water-resistive barrier and flexible flashings to rough opening before installation of metal flashings, sills, or frames, using method recommended by manufacturer.

D. Lap flexible flashing or flashing tape at least 2 inches on each side of joint or transition.

E. Install drainage layer or spacers after flashing tape has been completed.

3.04 INSTALLATION - INSULATION

A. Install in accordance with manufacturer's instructions.

B. Install back wrap reinforcing mesh at all openings and terminations that are not to be protected with trim.

C. On wall surfaces, install boards horizontally. On horizontal surfaces, install boards _____.

D. Place boards in a method to maximize tight joints. Stagger vertical joints and interlock at corners. Butt edges and ends tight to adjacent board and to protrusions. Achieve a continuous flush insulation surface, with no gaps in excess of 1/16 inch.

E. Fill gaps greater than 1/16 inch with strips or shims cut from the same insulation material.

F. Rasp irregularities off surface of installed insulation board.

3.05 INSTALLATION - CLASS PB FINISH

A. Base Coat: Apply in thickness as necessary to fully embed reinforcing mesh, wrinkle free, including back-wrap at terminations of EIFS. Install reinforcing fabric as recommended by EIFS manufacturer.
   1. Lap reinforcing mesh edges and ends a minimum of 2-1/2 inches.
   2. Allow base coat to dry a minimum of 24 hours before next coating application.

B. Apply finish coat after base coat has dried not less than 24 hours, embed finish aggregate, and finish to a uniform texture and color.

C. Seal control and expansion joints within the field of exterior finish and insulation system, using procedures recommended by sealant and finish system manufacturers.

END OF SECTION

SECTION 07 2500
WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water-Resistive Barrier: Under exterior wall cladding, over sheathing or other substrate; not air tight or vapor retardant.

B. Air Barriers: Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Vapor retarder under concrete slabs on grade.

B. Section 05 4000 - Cold-Formed Metal Framing: Water-resistive barrier under exterior cladding.

C. Section 07 6200 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.

D. Section 07 9005 - Joint Sealers: Sealant materials and installation techniques.

1.03 DEFINITIONS

A. Weather Barrier: Assemblies that form water-resistive barriers and air barriers and do not restrict moisture vapor moving from the interior to the exterior.

1.04 REFERENCE STANDARDS

A. AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test; 2014.

B. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2017.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

D. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

E. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on material characteristics.

C. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

1.06 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2 PRODUCTS

2.01 WEATHER BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

A. LOCATION : **Exterior face of gypsum sheathing where barrier will be concealed behind EIFS.**

1. Air Permeance: 0.004 cubic feet per minute per square foot, maximum, when tested in accordance with ASTM E2178.
2. Water Vapor Permeance: 20 perms, minimum, when tested in accordance with ASTM E96/E96M Procedure A (desiccant procedure).
3. Water Penetration Resistance: Withstand a water head of 21 inches, minimum, for minimum of 5 hours, when tested in accordance with AATCC Test Method 127.
4. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 180 days of weather exposure.

5. Surface Burning Characteristics: Flame spread index of 25 or less, and smoke developed index of 50 or less, when tested in accordance with ASTM E84.
6. Fluid applied
7. Manufacturers:
   a. DuPont Building Innovations; Tyvek Commercial Wrap D _____ www.dupont.com/#sle.
   b. Fiberweb, Inc; Typar MetroWrap: www.typar.com/#sle.
   c. Fortifiber Building Systems Group; WeatherSmart Commercial: www.fortifiber.com/#sle.
   d. VaproShield, LLC; RevealShield IT - Integrated Tape: www.vaproshield.com/#sle.
   e. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

B. LOCATION : **Exterior face of inner wyeth of masonry cavity walls**. Barrier Coating:
1. Dry Film Thickness (DFT): 10 mil, 0.010 inch, minimum.
2. Air Permeance: 0.001 cubic feet per minute per square foot, maximum, when tested in accordance with ASTM E2178.
3. Water Vapor Permeance: 25 perms, minimum, when tested in accordance with ASTM E96/E96M, Procedure B.
4. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to six months of weather exposure after application.
5. Manufacturers:
   a. Hohmann & Barnard, Inc; ENVIRO-BARRIER VP: www.h-b.com/#sle.
   b. Master Wall, Inc; Rollershield LAB System: www.masterwall.com/#sle.
   c. Parex USA, Inc; Parex USA WeatherSeal Spray & Roll-on: www.parexusa.com/#sle.
   d. PROSOCO, Inc; R-GUARD Spray Wrap MVP: www.prosoco.com/r-guard/#sle.

2.02 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.

B. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Obtain approval of installation procedures by the weather barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.

C. Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

D. Mechanically Fastened Sheets:
1. Install sheets shingle-fashion to shed water, with seams generally horizontal.
2. Overlap seams as recommended by manufacturer but at least 2 inches.
3. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches.

4. Attach to framed construction with fasteners extending through sheathing into framing. Space fasteners at 12 to 18 inches on center, or at spacing recommended by manufacturer, along each framing member supporting sheathing.
5. Seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners recommended by the manufacturer.
6. Refer to large scale exterior wall details included in the project drawings

E. Coatings:
1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.
2. Where exterior masonry veneer is to be installed over masonry backup, install masonry anchors before installing weather barrier over masonry; seal around anchors air tight.
3. Use flashing to seal to adjacent construction and to bridge joints.

F. Openings and Penetrations in Exterior Weather Barriers: Follow large scale drawings provided in the project drawing set. In the absense of applicable details the following will apply.
1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
2. At openings to be filled with non-flanged frames, seal weather barrier to each side of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
3. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
4. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Coordination of Tests and Inspections:
1. Allow access to barrier work areas and staging.
2. Do not cover barrier work until tested, inspected, and accepted.

C. Do not cover installed weather barriers until required inspections have been completed.

3.05 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 07 4113
METAL ROOF PANELS

PART 2 PRODUCTS

1.01 MANUFACTURERS

A. Metal Roof Panels:
   1. Metal Roofing Systems, Inc; System 2500 - Metal Roof Panels: www.metalroofingsystems.biz/#sle.
   2. Morin Corporation; Symmetry Roof Systems: www.morincorp.com/#sle.
   3. Petersen Aluminum Corporation; Tite-Loc Panel: www.pac-clad.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

1.02 ARCHITECTURAL METAL ROOF PANELS

A. Architectural Metal Roofing: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.

B. Metal Panels: Factory-formed panels with factory-applied finish.
   1. Aluminum Panels:
      a. Alloy and Temper: Aluminum complying with ASTM B209 (ASTM B209M); temper as required for forming.
      b. Thickness: Minimum 20 gage (0.032 inch).
   2. Profile: Standing seam, with minimum 1.5 inch seam height; concealed fastener system for field seaming with special tool.
   3. Texture: Smooth, with intermediate ribs for added stiffness.
   4. Width: Maximum panel coverage of 16 inches.

1.03 ATTACHMENT SYSTEM

A. Concealed System: Provide manufacturer's standard stainless steel or nylon-coated aluminum concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

1.04 FABRICATION

A. Panels: Provide factory or field fabricated panels with applied finish and accessory items, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.

1.05 FINISHES

A. Fluoropolymer Coil Coating System: Manufacturer's standard multi-coat aluminum coil coating system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of coil coated aluminum surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; color and gloss to match sample.

1.06 ACCESSORIES

A. Miscellaneous Sheet Metal Items: Provide flashings, trim, and closure strips of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.

B. Sealants:
   1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
   2. Concealed Sealant: Non-curing butyl sealant or tape sealant.

C. Underlayment: Self-adhering rubber-modified asphalt sheet complying with ASTM D1970/D1970M; 22 mil total thickness; with strippable release film and woven polypropylene sheet top surface.
   1. Minimum Requirements: Comply with requirements of ICC-ES AC188 for non-self-adhesive sheet.

2. Sheet Thickness: 22 mil, 0.022 inch minimum total thickness.
3. Self Sealability: Passing nail sealability test specified in ASTM D1970/D1970M.
4. Low Temperature Flexibility: Passing test specified in ASTM D1970/D1970M.
5. Water Vapor Permeance: 0.1 perm, maximum, when tested in accordance with ASTM E96/E96M Procedure A (desiccant method).
6. Manufacturers:
   a. Henry Company; Blueskin RF200: www.henry.com/#sle.
   b. Henry Company; Blueskin PE200HT: www.henry.com/#sle.
   c. Polyglass USA, Inc; Polystick MTS Self-Adhered High Temperature Roof Underlayment: www.polyglass.us/#sle.
   d. System Components Corporation, Inc; FelTex SA300: www.systemcomponents.net/#sle.
   e. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

PART 3 EXECUTION

2.01 EXAMINATION

A. Do not begin installation of preformed metal roof panels until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

2.02 PREPARATION

A. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to assure that the completed roof will be free of leaks.

B. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by roof panel manufacturer.

C. Where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

2.03 INSTALLATION

A. Overall: Install roofing system in accordance with approved shop drawings and panel manufacturer's instructions and recommendations, as applicable to specific project conditions. Anchor all components of roofing system securely in place while allowing for thermal and structural movement.
   1. Install roofing system with concealed clips and fasteners.
   2. Minimize field cutting of panels. Where field cutting is absolutely required, use methods that will not distort panel profiles. Use of torches for field cutting is absolutely prohibited.

B. Accessories: Install all components required for a complete roofing assembly, including flashings, trim, closure strips, rib closures, ridge closures, and similar roof accessory items.

C. Install underlayment membrane on roof deck cover board before installing preformed metal roof panels. Secure by methods acceptable to roof panel manufacturer, minimizing use of metal fasteners. Apply from eaves to ridge in shingle fashion, overlapping horizontal joints a minimum of 2 inches and side and end laps a minimum of 3 inches.

D. Roof Panels: Install panels in strict accordance with manufacturer's instructions, minimizing transverse joints except at junction with penetrations.
   1. Form weathertight standing seams incorporating concealed clips, using an automatic mechanical seaming device approved by the panel manufacturer.
   2. Install sealant or sealant tape, as recommended by panel manufacturer, at end laps and side joints.

2.04 CLEANING

A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

2.05 PROTECTION

A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.

B. Touch-up, repair, or replace damaged roof panels or accessories before Date of Substantial Completion.

END OF SECTION

SECTION 07 5100
BUILT-UP BITUMINOUS ROOFING REPAIR

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Built-up roofing membrane repair, conventional and protected membrane application.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood nailers and curbs.

B. Section 06 1000 - Rough Carpentry: Wood cant strips.

C. Section 07 7100 - Roof Specialties: Prefabricated roofing expansion joint flashing.

1.03 REFERENCE STANDARDS

A. ASTM D41/D41M - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing; 2011 (Reapproved 2016).

B. ASTM D312/D312M - Standard Specification for Asphalt Used in Roofing; 2016a.

C. ASTM D3909/D3909M - Standard Specification for Asphalt Roll Roofing (Glass Felt) Surfaced with Mineral Granules; 2014.

D. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007, with Editorial Revision (2012).

E. NRCA (RM) - The NRCA Roofing Manual; 2018.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of associated counterflashings installed by other sections as the work of this section proceeds.

B. Preinstallation Meeting: Convene one week before starting work of this section.
   1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating membrane and bitumen materials, base flashing materials, insulation, vapor retarder, surfacing, and _____.

C. Manufacturer's Installation Instructions: Indicate special procedures.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

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

B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact.

B. Store materials in weather protected environment, clear of ground and moisture.

C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

1.08 FIELD CONDITIONS

A. Do not apply roofing membrane during unsuitable weather.

B. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

D. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sheet and Bitumen Materials:
   1. CertainTeed Corporation; _____: www.certainteed.com/#sle.
   2. GAF; ____: www.gaf.com/#sle.
   3. Johns Manville; _____: www.jm.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.02 ROOFING - PROTECTED MEMBRANE APPLICATION

2.03 SHEET MATERIALS

A. White Cap Sheet: Asphalt-saturated glass fiber roll roofing surfaced with flexible acrylic coating and ceramic granules; complying with ASTM D3909/D3909M.
   1. Solar Reflectance: 0.75, minimum, initial, and 0.60, minimum, 3-year aged, certified by Cool Roof Rating Council.
   2. Thermal Emissivity: 0.80, minimum, initial, and 0.85, minimum, 3-year aged, certified by Cool Roof Rating Council.
   3. Manufacturers:
      a. CertainTeed Corporation; Flintglas MS Cap CoolStar: www.certainteed.com/#sle.
      b. GAF; ____: www.gaf.com/#sle.
      c. Johns Manville; _____: www.jm.com/#sle.
      d. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.04 BITUMINOUS MATERIALS

A. Bitumen: ASTM D312/D312M Type I, asphalt.

B. Primer: ASTM D41/D41M, asphalt type.

C. Roof Cement: ASTM D4586/D4586M, Type I, asbestos free.

2.05 INSULATION

A. Existing insulating concrete is to remain in place.

2.06 ACCESSORIES

A. Prefabricated Roofing Expansion Joint Flashing: As specified in Section 07 7100.

B. Cant Strips: Wood; pressure treated and redried preservative treated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.02 CONCRETE DECK PREPARATION

A. Fill surface honeycomb and variations with latex filler.

B. Confirm dry deck by moisture meter with 12 percent moisture maximum.

C. Protected Membrane Application: Mop cant strips in place with hot bitumen.

3.03 MEMBRANE APPLICATION

A. Install built-up bituminous roofing system in accordance with manufacturers recommendations and NRCA (RM) applicable requirements.

B. Equiviscous Temperature (EVT) at Point of Application: Comply with NRCA (RM) recommendations.

C. Apply membrane plies, weather lap edges and ends, and mop with 20 lbs/square (100 sq ft) of bitumen per ply. Apply plies 2 on 2 in same direction.

D. Apply smooth, free from air pockets, wrinkles, fish-mouths, or tears.

E. At end of day's operation, install two plies membrane and bitumen glaze coat for cut-off. Glaze exposed felts. Remove cut-off before resuming roofing.

F. At intersections with vertical surfaces:
   1. Extend membrane and base sheet over cant strips and up a minimum of 4 inches onto vertical surfaces.
   2. Mop on base flashing of two additional plies of felt and one ply of base flashing material.

G. Around roof penetrations, mop in and seal flanges and flashings with two additional plies of felt.

H. Install roofing expansion joints where indicated. Make joints watertight.

I. Coordinate installation of roof drains and related flashings.

3.04 CLEANING

A. Remove bituminous markings from finished surfaces.

B. In areas where finished surfaces are soiled by bitumen or other source of soiling caused by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.

C. Repair or replace defaced or damaged finishes caused by work of this section.

3.05 PROTECTION

A. Protect installed roofing and flashings from construction operations.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 07 5400
THERMOPLASTIC MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Adhered system with thermoplastic roofing membrane.

B. Insulation, flat and tapered.

C. Deck sheathing.

D. Flashings.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood nailers and curbs.

B. Section 07 6200 - Sheet Metal Flashing and Trim: Counterflashings, reglets and _____.

C. Section 07 7100 - Roof Specialties: Prefabricated roofing expansion joint flashing.

1.03 REFERENCE STANDARDS

A. ASTM C1325 - Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units; 2017a.

B. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing; 2017.

C. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces; 2011.

D. FM (AG) - FM Approval Guide; current edition.

E. NRCA (RM) - The NRCA Roofing Manual; 2018.

F. NRCA (WM) - The NRCA Waterproofing Manual; 2005.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, vapor retarder, surfacing, and fasteners.

C. Shop Drawings: Submit drawings that indicate joint or termination detail conditions, conditions of interface with other materials, setting plan for tapered insulation, mechanical fastener layout, and wind uplift capacity of system must resist uplift loads as shown on structural drawings. .

D. Manufacturer's Qualification Statement.

E. Warranty Documentation:
   1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
   2. Submit installer's certification that installation complies with warranty conditions for waterproof membrane.

1.05 QUALITY ASSURANCE

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

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
   1. Warranty Term: 20 years.
   2. For repair and replacement include costs of both material and labor in warranty.
   3. Exceptions are permitted for the follwoing :
      a. Damage due to roof traffic.

b. Damage due to wind speed greater than 147 mph.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Thermoplastic Polyolefin (TPO) Membrane Roofing Materials:
1. Carlisle Roofing Systems, Inc; _____: www.carlisle-syntec.com/#sle.
2. Firestone Building Products, LLC; _____: www.firestonebpco.com/#sle.
3. GAF; _____ ____: www.gaf.com/#sle.
4. Johns Manville; _____: www.jm.com/#sle.
5. Versico, a division of Carlisle Construction Materials Inc; ____: www.versico.com/#sle.
6. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.02 ROOFING - UNBALLASTED APPLICATIONS

A. Thermoplastic Membrane Roofing: One ply membrane, fully adhered, over vapor retarder and insulation.

B. Roofing Assembly Requirements:
1. Solar Reflectance Index (SRI): 78, minimum, calculated in accordance with ASTM E1980.
a. Field applied coating may not be used to achieve specified SRI.

C. Acceptable Insulation Types - Constant Thickness Application: Any type that meets requirements and is approved by membrane manufacturer for application.
1. Minimum 2 layers of polyisocyanurate board.

D. Acceptable Insulation Types - Tapered Application: _____.
1. Tapered polyisocyanurate, perlite, or extruded polystyrene board.

2.03 MEMBRANE ROOFING AND ASSOCIATED MATERIALS

A. Membrane Roofing Materials:
1. TPO: Thermoplastic polyolefin (TPO) complying with ASTM D6878/D6878M, sheet contains reinforcing fabrics or scrims.
a. Thickness: 60 mil, 0.060 inch, minimum.
2. Sheet Width: Factory fabricated into largest sheets possible.
3. Color: White.

B. Seaming Materials: As recommended by membrane manufacturer.

C. Flexible Flashing Material: Same material as membrane.

2.04 DECK SHEATHING AND COVER BOARDS

A. Cover Board: Cement board, complying with ASTM C1325.
1. Board Size: 48 by 96 inch.
2. Board Thickness: 1/2 inch.
3. Manufacturers:
a. National Gypsum Company; DEXcell Cement Roof Board: www.nationalgypsum.com/#sle.
b. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.05 ACCESSORIES

A. Roofing Expansion Joint Flashing: Sheet metal, as specified in Section 07 6200.

B. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.

C. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.

D. Membrane Adhesive: As recommended by membrane manufacturer.

E. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane.
1. Composition: Roofing membrane manufacturer's standard.
2. Surface Color: yellow.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Perform work in accordance with manufacturer's instructions, NRCA (RM), and NRCA (WM) applicable requirements.

B. Do not apply roofing membrane during unsuitable weather.

C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.

D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

3.02 VAPOR RETARDER AND INSULATION - UNDER MEMBRANE

A. Attachment of Insulation: Mechanically fasten insulation to deck in accordance with roofing manufacturer's instructions and FM (AG) Factory Mutual requirements.

B. Cover Boards: Mechanically fasten cover boards in accordance with roofing manufacturer's instructions and FM (AG) Factory Mutual requirements.

C. Lay subsequent layers of insulation with joints staggered minimum 6 inch from joints of preceding layer.

D. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.

E. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

F. Do not apply more insulation than can be covered with membrane in same day.

3.03 MEMBRANE APPLICATION

A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.

B. Shingle joints on sloped substrate in direction of drainage.

C. Fully Adhered Application: Apply adhesive to substrate at rate of ____ gal/sq ft. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.

D. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.

E. At intersections with vertical surfaces:
   1. Extend membrane over cant strips and up a minimum of 6 inches onto vertical surfaces.
   2. Fully adhere flexible flashing over membrane and up to above termination bar and cover with counter flashing .

F. Around roof penetrations, seal flanges and flashings with flexible flashing.

G. Install roofing expansion joints where indicated. Make joints watertight.

H. Coordinate installation of roof drains and sumps and related flashings.

END OF SECTION

SECTION 07 6200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, gutters, downspouts, and roof through parapet scuppers

B. Sealants for joints within sheet metal fabrications.

C. Reglets and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 2500 - Weather Barriers.

B. Section 07 7200 - Roof Accessories

C. Section 07 5400 - Thermoplastic Membrane Roofing

D. Section 07 9200 - Joint Sealants

1.03 REFERENCE STANDARDS

A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

D. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction; 2012.

E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

F. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 5 years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. Pre-Finished Aluminum: ASTM B209 (ASTM B209M); 20 gage, (0.032 inch) thick; plain finish shop pre-coated with fluoropolymer coating.
   1. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system.
   2. Color: As selected by Architect from manufacturer's full colors.

B. Copper: ASTM B370, cold rolled 16 oz/sq ft (24 gage) (0.0216 inch) thick; natural finish.

2.02 ACCESSORIES

A. Fasteners: Stainless steel, with soft neoprene washers.

B. Protective Backing Paint: Asphaltic mastic, ASTM D4479 Type I.

2.03 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Fabricate cleats of same type sheet metal, minimum 3 inches wide, interlocking with sheet or contiuous as indicated in the project details.

C. Form pieces in longest possible lengths.

D. Hem exposed edges on underside 1/2 inch; miter and seam corners.

E. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

2.04 ACCESSORIES

A. Fasteners: Stainless steel, with soft neoprene washers.

B. Underlayment: See Section 07 2500 Weather Barriers.

C. Concealed Sealants: Non-curing butyl sealant.

D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through walls and roof are solidly set.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

A. Comply with drawing details.

B. Secure flashings in place using concealed fasteners

C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Seal metal joints watertight.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for field inspection requirements.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION

SECTION 07 7200
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof penetrations mounting curbs.

1.02 RELATED REQUIREMENTS

A. Section 05 3100 - Steel Decking.

B. Section 07 5400 - Thermoplastic Membrane Roofing

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.

C. Warranty Documentation:
   1. Submit manufacturer warranty.
   2. Ensure that forms have been completed in Owner's name and registered with manufacturer.
   3. Submit documentation that roof accessories are acceptable to roofing manufacturer, and do not limit the roofing warranty.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 ROOF CURBS

A. Manufacturers:
   1. AES Industries Inc; _____: www.aescurb.com/#sle.
   2. The Pate Company; _____: www.patecurbs.com/#sle.
   3. Roof Products & Systems (RPS); _____: www.rpscurbs.com/#sle.
   4. Substitutions: See Instructions to Bidders, Article 13

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.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.04 CLEANING

A. Clean installed work to like-new condition.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07 8100
APPLIED FIREPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fireproofing of interior structural steel not exposed to damage or moisture.

1.02 RELATED REQUIREMENTS

A. Section 05 1200 - Structural Steel Framing.

B. Section 07 8400 - Firestopping.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

B. ASTM E605/E605M - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 1993, with Editorial Revision (2015).

C. ASTM E736/E736M - Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members; 2017.

D. ASTM E759/E759M - Standard Test Method for Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members; 1992, with Editorial Revision (2015).

E. ASTM E760/E760M - Standard Test Method for Effect of Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members; 1992, with Editorial Revision (2015).

F. ASTM E761/E761M - Standard Test Method for Compressive Strength of Sprayed Fire-Resistive Material Applied to Structural Members; 1992, with Editorial Revision (2015).

G. ASTM E859/E859M - Standard Test Method for Air Erosion of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 1993, with Editorial Revision (2015).

H. ASTM E937/E937M - Standard Test Method for Corrosion of Steel by Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 1993, with Editorial Revision (2015).

I. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with placement of ceiling hanger tabs, mechanical component hangers, and electrical components.

B. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittals procedures.

B. Product Data: Provide data indicating product characteristics.

C. Manufacturer's Certificate: Certify that applied fireproofing products meet or exceed requirements of contract documents.

D. Test Reports: Reports from reputable independent testing agencies for proposed products, indicating compliance with specified criteria, conducted under conditions similar to those on project, as follows:
   1. Bond strength.
   2. Bond impact.
   3. Compressive strength.
   4. Fire tests using substrate materials similar those on project.

E. Manufacturer's Installation Instructions: Indicate special procedures.

F. Field Quality Control Submittals: Submit field test report.

G. Manufacturer Reports: Indicate environmental conditions in which applied fireproofing materials were installed.

H. Manufacturer's Qualification Statement.

I. Installer's Qualification Statement.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience

1.07 FIELD CONDITIONS

A. Do not apply fireproofing when temperature of substrate material and surrounding air is below 40 degrees F or when temperature is predicted to be below said temperature for 24 hours after application.

B. Provide ventilation in areas to receive fireproofing during application and 24 hours afterward, to dry applied material.

C. Provide temporary enclosure to prevent spray from contaminating air.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion.
   1. Include coverage for fireproofing to remain free from cracking, checking, dusting, flaking, spalling, separation, and blistering.
   2. Reinstall or repair failures that occur within warranty period.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Applied Fireproofing:
   1. GCP Applied Technologies; _____: www.gcpat.com/#sle.
   2. Isolatek International Corp; _____: www.isolatek.com/#sle.
   3. Southwest Fireproofing Products Company; ____: www.sfrm.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.02 FIREPROOFING ASSEMBLIES

A. Provide assemblies as indicated on drawings.

B. UL listings with a Load Restriction are not allowed.

2.03 MATERIALS

A. Applied Fireproofing Material for Interior Applications, Concealed: Manufacturer's standard factory mixed material, which when combined with water is capable of providing indicated fire resistance, and complying with following requirements:
   1. Bond Strength: 150 pounds per square foot, minimum, when tested in accordance with ASTM E736/E736M when set and dry.
   2. Compressive Strength: 8.33 pounds per square inch, minimum.
   3. Effect of Impact on Bonding: No cracking, spalling or delamination, when tested in accordance with ASTM E760/E760M.
   4. Corrosivity: No evidence of corrosion, when tested in accordance with ASTM E937/E937M.
   5. Surface Burning Characteristics: Maximum flame spread index of 0 (zero) and maximum smoke developed index of 0 (zero), when tested in accordance with ASTM E84.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive fireproofing.

B. Verify that clips, hangers, supports, sleeves, and other items required to penetrate fireproofing are in place.

C. Verify that ducts, piping, equipment, or other items that would interfere with application of fireproofing have not been installed.

D. Verify that voids and cracks in substrate have been filled.

E. Verify that projections have been removed where fireproofing will be exposed to view as a finish material.

3.02 PREPARATION

A. Perform tests as recommended by fireproofing manufacturer in applications where adhesion of fireproofing to substrate is in question.

B. Remove incompatible materials that could effect bond by scraping, brushing, scrubbing, or sandblasting.

C. Prepare substrates to receive fireproofing in strict accordance with instructions of fireproofing manufacturer.

D. Apply fireproofing manufacturer's recommended bonding agent on primed steel.

E. Protect surfaces not scheduled for fireproofing and equipment from damage by overspray, fall-out, and dusting.

F. Close off and seal duct work in areas where fireproofing is being applied.

3.03 APPLICATION

A. Apply primer adhesive in accordance with manufacturer's instructions.

B. Apply fireproofing in uniform thickness and density as necessary to achieve required ratings.

3.04 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 4000 - Quality Requirements.

B. Inspect installed fireproofing after application and curing for integrity, prior to its concealment.
   1. Submit field test reports promptly to Contractor and Architect.

C. Ensure that actual thicknesses, densities, and bond strengths meet requirements for specified ratings and requirements of authorities having jurisdiction (AHJ).

D. Repair or replace applied fireproofing at locations where test results indicate fireproofing does not meet specified requirements.

E. Re-inspect installed fireproofing for integrity of fire protection, after installation of subsequent Work.

3.05 CLEANING

A. Remove excess material, overspray, droppings, and debris.

B. Remove fireproofing from materials and surfaces not required to be fireproofed.

END OF SECTION

SECTION 07 8400
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of all joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED REQUIREMENTS

A. Section 01 7000 - Execution and Closeout Requirements: Cutting and patching.

B. Section 07 8100 - Applied Fireproofing.

C. Section 09 2116 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.03 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2016a.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

C. ITS (DIR) - Directory of Listed Products; current edition.

D. FM (AG) - FM Approval Guide; current edition.

E. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.

F. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - 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. Certificate from authority having jurisdiction indicating approval of materials used.

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) will be considered as constituting an acceptable test report.

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. Trained by manufacturer.
   2. Verification of minimum three years documented experience installing work of this type.

1.06 MOCK-UP

A. Install one firestopping assembly representative of each fire rating design required on project.
   1. Where one design may be used for different penetrating items or in different wall constructions, install one assembly for each different combination.
   2. Where firestopping is intended to fill a linear opening, install minimum of 1 linear ft.

B. Obtain approval of authorities having jurisdiction (AHJ) before proceeding.

C. If accepted, mock-up will represent minimum standard for the Work.

D. If accepted, mock-up may remain as part of the Work. Remove and replace mock-ups not accepted.

1.07 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 MATERIALS

A. Manufacturers:
   1. 3M Fire Protection Products; _____: www.3m.com/firestop.
   2. Hilti, Inc: www.us.hilti.com/#sle.
   3. Nelson FireStop Products; _____: www.nelsonfirestop.com.
   4. Specified Technologies, Inc.; _____: www.stifirestop.com.
   5. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

C. Fire Ratings: Refer to drawings for required systems and ratings.

2.02 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.
   2. Fire Ratings: See drawings for required systems and ratings.

B. Firestopping Between Top of Partition Wall and Roof Slab: Fiber firestopping with smoke seal coating; UL Design No. ____, F Rating __ hour, provide at locations as indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

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.

C. Install labeling required by code.

3.04 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 9200
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Joint backings and accessories.

C. Owner-provided field quality control.

1.02 RELATED REQUIREMENTS

A. Section 07 2500 - Weather Barriers: Sealants required in conjunction with air barriers and vapor retarders.

B. Section 07 8400 - Firestopping: Firestopping sealants.

C. Section 07 9100 - Preformed Joint Seals: Precompressed foam, gaskets, and strip seals.

D. Section 08 7100 - Door Hardware: Setting exterior door thresholds in sealant.

E. Section 08 8000 - Glazing: Glazing sealants and accessories.

F. Section 09 2116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

G. Section 09 2216 - Non-Structural Metal Framing: Sealing between framing and adjacent construction in acoustical and sound-rated walls and ceilings.

H. Section 09 3000 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

I. Section 23 3100 - HVAC Ducts and Casings: Duct sealants.

1.03 REFERENCE STANDARDS

A. ASTM C834 - Standard Specification for Latex Sealants; 2017.

B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2012 (Reapproved 2017).

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

E. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2008 (Reapproved 2012).

F. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints; 2013.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes 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. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.
   5. Substrates for which use of primer is required.

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. Installation Plan: Submit at least four weeks prior to start of installation.

F. Preinstallation Field Adhesion Test Plan: Submit at least two weeks prior to start of installation.

G. Field Quality Control Plan: Submit at least two weeks prior to start of installation.

H. Preinstallation Field Adhesion Test Reports: Submit filled out Preinstallation Field Adhesion Test Reports log within 10 days after completion of tests; include bagged test samples and photographic records.

I. Installation Log: Submit filled out log for each length or instance of sealant installed.

J. Field Quality Control Log: Submit filled out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.

1.05 QUALITY ASSURANCE

A. Maintain one copy of each referenced document covering installation requirements on site.

B. Installation Plan: Include schedule of sealed joints, including the following.
   1. Installation Log Form: Include the following data fields, with known information filled out.
      a. Location on project.
      b. Substrates.
      c. Sealant used.
      d. Stated movement capability of sealant.
      e. Primer to be used, or indicate as "No primer" used.
      f. Size and actual backing material used.
      g. Date of installation.
      h. Name of installer.
      i. Actual joint width; provide space to indicate maximum and minimum width.
      j. Actual joint depth to face of backing material at centerline of joint.
      k. Air temperature.

C. Preinstallation Field Adhesion Test Plan: Include destructive field adhesion testing of one sample of each combination of sealant type and substrate, except interior acrylic latex sealants, and include the following for each tested sample.
   1. Identification of testing agency.
   2. Preinstallation Field Adhesion Test Log Form: Include the following data fields, with known information filled out.
      a. Test date.
      b. Location on project.
      c. Sealant used.
      d. Stated movement capability of sealant.
      e. Test method used.
      f. Date of installation of field sample to be tested.
      g. Date of test.
      h. Copy of test method documents.
      i. Age of sealant upon date of testing.
      j. Test results, modeled after the sample form in the test method document.
      k. Indicate use of photographic record of test.

D. Owner will employ an independent testing agency to perform the field quality control inspection and testing as referenced in PART 3 of this section and as follows, to prepare and submit the field quality control plan and log, and to provide recommendations of remedies in the case of failure.
   1. Contractor shall cooperate with testing agency and repair failures discovered and destructive test location damage.

E. Field Quality Control Plan:
   1. Visual inspection of entire length of sealant joints.

2. Non-destructive field adhesion testing of sealant joints, except interior acrylic latex sealants.
3. Destructive field adhesion testing of sealant joints, except interior acrylic latex sealant.
   a. For each different sealant and substrate combination, allow for one test every 30 feet in the first 90 linear feet, and one test per 90 linear feet thereafter, or once per floor on each elevation.
   b. If any failures occur in the first 30 linear feet, continue testing at frequency of one test per 30 linear feet at no extra cost to Owner.
4. Field Quality Control Log Form: Show same data fields as on Preinstallation Field Adhesion Test Log, with known information filled out and lines for multiple tests per sealant/substrate combinations; include visual inspection and specified field testing; allow for possibility that more tests than minimum specified may be necessary.

F. Field Adhesion Test Procedures:
1. Allow sealants to fully cure as recommended by manufacturer before testing.
2. Have a copy of the test method document available during tests.
3. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
4. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
5. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.

G. Non-Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Nondestructive Spot Method.

H. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
1. Sample: At least 18 inch long.
2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch by that percentage; if adhesion failure occurs before the "1 inch mark" is that distance from the substrate, the test has failed.
3. If either adhesive or cohesive failure occurs prior to minimum elongation, take necessary measures to correct conditions and re-test; record each modification to products or installation procedures.
4. Record results on Field Quality Control Log.
5. Repair failed portions of joints.

I. Field Adhesion Tests of Joints: Test for adhesion using most appropriate method in accordance with ASTM C1521, or other applicable method as recommended by manufacturer.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.

a. Wall expansion and control joints.
b. Joints between door, window, and other frames and adjacent construction.
c. Joints between different exposed materials.
d. Horizontal joint below galvinized structural shelf angles supporting masonry.
e. Vertical control joints in masonry.

2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
   a. Joints between door, window, and other frames and adjacent construction.
   b. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
3. Do not seal the following types of joints.
   a. Intentional weepholes in masonry.
   b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
   c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
   d. Joints where installation of sealant is specified in another section.
   e. Joints between suspended panel ceilings/grid and walls.

B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.

C. Interior Joints: Use non-sag _____ sealant
1. Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
2. Wall and Ceiling Joints in Wet Areas: polyurethane
3. Floor Joints in Wet Areas: Non-sag polyurethane "non-traffic-grade"
4. Type ___ - In Sound-Rated Assemblies: Acrylic emulsion latex sealant.

D. Sound-Rated Assemblies: Walls and ceilings identified as "STC-rated", "sound-rated", or "acoustical".

2.03 NONSAG JOINT SEALANTS

A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
1. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
2. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
3. Color: To be selected by Architect from manufacturer's standard range.
4. Cure Type: Single-component, neutral moisture curing.
5. Manufacturers:
   a. Dow Chemical Company; DOWSIL 790 Silicone Building Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
   b. Sika Corporation; Sikasil WS-290: www.usa-sika.com/#sle.
   c. Tremco Commercial Sealants & Waterproofing; Spectrem 1: www.tremcosealants.com/#sle.
   d. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

B. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
1. Color: To be selected by Architect from manufacturer's standard range.
2. Manufacturers:
   a. Sherwin-Williams Company; 850A Acrylic Latex Caulk: www.sherwin-williams.com/#sle.
   b. Sherwin-Williams Company; 950A Siliconized Acrylic Latex Caulk: www.sherwin-williams.com/#sle.
   c. Top Gun, a brand of PPG Architectural Coatings; Top Gun 200: www.ppgpaints.com/#sle.
   d. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.04 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.

E. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

D. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
   1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
   2. Notify Architect of date and time that tests will be performed, at least 7 days in advance.
   3. Record each test on Preinstallation Adhesion Test Log as indicated.
   4. If any sample fails, review products and installation procedures, consult manufacturer, or take whatever other measures are necessary to ensure adhesion; re-test in a different location; if unable to obtain satisfactory adhesion, report to Architect.
   5. After completion of tests, remove remaining sample material and prepare joint for new sealant installation.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Perform acoustical sealant application work in accordance with ASTM C919.

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. Owner will employ an independent testing agency to perform field quality control inspection as specified in PART 1 under QUALITY ASSURANCE article.

B. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

END OF SECTION

SECTION 07 9513
EXPANSION JOINT COVER ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Expansion joint cover assemblies for floor and wall surfaces.

1.02 RELATED REQUIREMENTS

A. Section 03 1000 - Concrete Forming and Accessories: Placement of joint cover assembly frames in formwork.

B. Section 04 2000 - Unit Masonry: Placement of joint cover assembly frames in masonry.

C. Section 07 7100 - Roof Specialties: Roof expansion and control joint covers.

D. Section 07 9200 - Joint Sealants: Sealing expansion and control joints using gunnable and pourable sealants.

1.03 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

C. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles; 2010.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices and available colors and finish.

C. Shop Drawings: Indicate joint and splice locations, miters, layout of the work, affected adjacent construction and anchorage locations.

D. Manufacturer's Installation Instructions: Indicate rough-in sizes and required tolerances for item placement.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Expansion Joint Cover Assemblies:
   1. Architectural Art Mfg, Inc; _____: www.archart.com/#sle.
   2. Construction Specialties, Inc; _____: www.c-sgroup.com/#sle.
   3. Inpro; _____: www.inprocorp.com/#sle.
   4. MM Systems Corp; _____: www.mmsystemscorp.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.02 EXPANSION JOINT COVER ASSEMBLY APPLICATIONS

A. Interior Floor Joints Subject to Wind & Seismic Movement:
   1. Manufacturers:
      a. MM Systems Corp: LSSB-NBR 2-1 .
      b. Architectural Art Mfg; A20-13-11.

B. Interior Non-Fire-Rated Wall/Ceiling Joints Subject to Wind & Seismic Movement:
   1. Manufacturers:
      a. Construction Specialties, Inc; Flush Thinline-Twinline Wall and Ceiling Covers: www.c-sgroup.com/#sle.
      b. MM Systems Corp; FSWP-200..
      c. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.03 EXPANSION JOINT COVER ASSEMBLIES

A. Expansion Joint Cover Assemblies - General: Factory-fabricated and assembled; designed to completely fill joint openings, sealed to prevent passage of air, dust, water, smoke; suitable for traffic expected.
   1. Joint Dimensions and Configurations: As indicated on drawings.
   2. Joint Cover Sizes: Selected to suit joint width and configuration, based on manufacturer's published recommendations and limitations.
   3. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
   4. Anchors, Fasteners, and Fittings: Provided by cover manufacturer.

B. Floor Joint Covers: Coordinate with indicated floor coverings.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper; or ASTM B308/B308M, 6061 alloy, T6 temper.
   1. Exposed Finish at Floors: Mill finish or natural anodized.
   2. Exposed Finish at Walls and Ceilings: Natural anodized.

B. Backing Paint for Aluminum Components in Contact with Cementitious Materials: Asphaltic type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joint preparation and dimensions are acceptable and in accordance with manufacturer's requirements.

B. Verify that frames and anchors installed by others are in correct locations and suitable for installation of remainder of assembly.

3.02 INSTALLATION

A. Install components and accessories in accordance with manufacturer's instructions.

B. Align work plumb and level, flush with adjacent surfaces.

C. Rigidly anchor to substrate to prevent misalignment.

3.03 PROTECTION

A. Do not permit traffic over unprotected floor joint surfaces.

B. Provide strippable coating to protect finish surface.

END OF SECTION

SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Hollow metal frames for wood doors.

C. Hollow metal borrowed lites glazing frames.

1.02 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware.

B. Section 09 9123 - Interior Painting: Field painting.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.

C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.

D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.

E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2016.

H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2017.

I. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2016.

J. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

K. ITS (DIR) - Directory of Listed Products; current edition.

L. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

M. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

N. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.

O. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

P. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2018.

Q. UL (DIR) - Online Certifications Directory; Current Edition.

R. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

D. Manufacturer's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.

B. Manufacturer Qualifications: Provide hollow metal doors and frames from SDI Certified manufacturer: www.steeldoor.org/sdicertified.php/#sle.

C. Maintain at project site copies of reference standards relating to installation of products specified.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:
1. Ceco Door, an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
2. Curries, an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
3. Republic Doors, an Allegion brand; ____: www.republicdoor.com/#sle.
4. Steelcraft, an Allegion brand; ____: www.allegion.com/#sle.
5. Pioneer Industrieswww.pioneerindustries.com
6. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
2. Accessibility: Comply with ICC A117.1 and ADA Standards.
3. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturers standard.
4. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
5. Galvannealed All doors and frames : All components hot-dipped zinc-iron alloy-coated (galvannealed), A60/ZF180.
    a. Based on SDI Standards: Provide at least A40/ZF120 (galvannealed) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvannealed) for corrosive locations.
6. Finish: Factory primed, for field finishing.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. Door Finish: Factory primed and field finished.

B. Interior Doors, Non-Fire Rated:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.
   2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
   3. Door Thickness: 1-3/4 inch, nominal.

C. Type ___, Fire-Rated Doors:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.
   2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
      a. Provide units listed and labeled by UL (DIR) or ITS (DIR).
      b. Attach fire rating label to each fire rated unit.
   3. Door Thickness: 1-3/4 inch, nominal.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. General:
   1. Finish: Factory primed, for field finishing.

C. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
   1. Frame Metal Thickness: 18 gage, 0.042 inch, minimum.

D. Door Frames, Fire-Rated: Knock-down type.
   1. Fire Rating: Same as door, labeled.

E. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.

F. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.

G. Transom Bars: Fixed, of profile same as jamb and head.

H. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.

I. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inch high to fill opening without cutting masonry units.

J. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

2.05 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.06 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Install door hardware as specified in Section 08 7100.

3.03 TOLERANCES

A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.04 ADJUSTING

A. Adjust for smooth and balanced door movement.

3.05 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08 1416
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush and flush glazed configuration; non-rated.

1.02 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames.

B. Section 08 7100 - Door Hardware.

C. Section 08 8000 - Glazing.

1.03 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2017).

C. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

D. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2013.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
   1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

D. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

E. Specimen warranty.

F. Samples: Submit two samples of door veneer, 4 by 4 inch in size illustrating wood grain, stain color, and sheen.

G. Manufacturer's Installation Instructions: Indicate special installation instructions.

H. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.
   1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

B. Quality Certification:
   1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
   2. Provide designated labels on shop drawings as required by certification program.
   3. Provide designated labels on installed products as required by certification program.
   4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Building is to be under HVAC control prior to doors being delivered.

B. Package, deliver and store doors in accordance with specified quality standard.

C. Accept doors on site in manufacturer's packaging. Inspect for damage.

D. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Interior Doors: Provide manufacturer's warranty for the life of the installation.

C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood Veneer Faced Doors:
   1. Graham Wood Doors: www.grahamdoors.com.
   2. Eggers Industries; ____: www.eggersindustries.com/#sle.
   3. Haley Brothers; ____: www.haleybros.com/#sle.
   4. Marshfield DoorSystems, Inc; ____: www.marshfielddoors.com/#sle.
   5. Oregon Door; Architectural Series: www.oregondoor.com/#sle.
   6. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.02 DOORS _____

A. Doors: Refer to drawings for locations and additional requirements.
   1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with WDMA I.S. 1A.
   2. Wood Veneer Faced Doors: 5-ply or 7-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
   1. Provide solid core doors at each location.

2.03 DOOR CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.

B. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

2.04 DOOR FACINGS

A. Veneer Facing for Transparent Finish: Red oak, veneer grade in accordance with quality standard indicated, rift cut (only red and white oak), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
   1. Vertical Edges: Compatible hardwood.

2.05 ACCESSORIES

A. Metal Louvers: _____ manufactured by _____.

B. Glazing Stops: Non rated doors, Wood, of same species as door facing, mitered corners; prepared for countersink style screws.

C. Glazing Stops: Rated doors, Low profile, 20 ga. cold rolled steel, mitered corners; prepared for countersink style screws installed from stair well side. Pre finish baked enamel finish in color selected by architect.
   1. Anemostat vision frames: Product, LoPro.

2.06 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:
   1. Provide solid blocks at lock edge for hardware reinforcement.

2. Provide solid blocking for other throughbolted hardware.

C. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.

D. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

E. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

F. Provide edge clearances in accordance with the quality standard specified.

2.07 FACTORY FINISHING - WOOD VENEER DOORS

A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 10, UV Curable, Water-based.
      b. Stain: As selected by Architect.
      c. Sheen: Satin.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.
   1. Install fire-rated doors in accordance with NFPA 80 requirements.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Coordinate installation of doors with installation of frames and hardware.

D. Coordinate installation of glazing.

3.03 TOLERANCES

A. Comply with specified quality standard for fit and clearance tolerances.

B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

3.05 SCHEDULE

A. Refer to Door and Frame Schedule on drawings .

END OF SECTION

SECTION 08 4229
AUTOMATIC ENTRANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Packaged power-operated door assemblies of following types:
   1. Swinging type.

B. Controllers, actuators and safety devices.

C. Maintenance.

1.02 RELATED REQUIREMENTS

A. Section 26 0583 - Wiring Connections.

B. Section 28 1000 - Access Control: Connection to access control system; access control devices used as actuators.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

C. BHMA A156.10 - American National Standard for Power Operated Pedestrian Doors; 2011.

D. BHMA A156.19 - American National Standard for Power Assist and Low Energy Power Operated Doors; 2013.

E. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2011.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. NFPA 101 - Life Safety Code; 2015.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Indicate layout and dimensions; head, jamb, and sill conditions; elevations; components, anchorage, recesses, materials, and finishes, electrical characteristics and connection requirements.
   2. Identify installation tolerances required, assembly conditions, routing of service lines and conduit, and locations of operating components and boxes.

C. Product Data: Provide data on system components, sizes, features, and finishes.

D. Manufacturer's Qualification Statement.

E. Installer's Qualification Statement.

F. Maintenance Contract.

G. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.

H. Maintenance Data: Include manufacturer's parts list and maintenance instructions for each type of hardware and operating component.

I. Warranty: 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, and a member of AAADM.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Swinging Automatic Entrance Door Assemblies:
   1. ASSA ABLOY Entrance Solutions; Besam SW200i: www.besam-usa.com/#sle.
   2. Horton Automatics; _____: www.hortondoors.com/#sle.
   3. Portalp USA; ISO Series: www.portalpusa.com/#sle.
   4. record-usa; 6100 Series (Low-Energy): www.recorddoors.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.02 POWER OPERATED DOORS

A. Power Operated Doors: Provide products that comply with NFPA 101 and requirements of authorities having jurisdiction; provide equipment selected for actual door weight and for light pedestrian traffic, unless otherwise indicated.
   1. Packaged Door Assemblies: Provide components by single manufacturer, factory-assembled, including doors, frames, operators, actuators, and safeties.
      a. Finish exposed equipment components to match door and frame finish.
   2. Air Leakage: Maximum of 1.0 cu ft/min/sq ft of wall area, when tested in accordance with ASTM E283 at 1.57 lbs/sq ft pressure differential across assembly.
   3. Exterior Swinging Doors: Provide equipment capable of operating, closing, and holding doors closed under positive and negative differential pressure; if necessary, provide power closing.
   4. Exterior and Vestibule Doors: Provide equipment suitable for operating temperature range of minus 20 to plus 140 degrees F ambient.

B. Swinging Doors with Low-Energy Power Operators: Comply with BHMA A156.19; operator activated by pushing or pulling the door or by a manual actuator, not a sensor; safeties not required.
   1. Kinetic Energy of Door in Motion: 1.25 pound-force foot, maximum.

2.03 AUTOMATIC ENTRANCE DOOR ASSEMBLIES

A. Comply with ADA Standards for egress requirements.

B. Framing Members: Provide manufacturer's standard extruded aluminum framing, reinforced as required to support imposed loads.

C. Swinging Automatic Door, Type ___: Single-acting hinged, electric operation, extruded aluminum glazed door, with extruded tubular frame, and operator concealed overhead.
   1. Operation: Full-power open, spring close operation.
   2. Push-Side Actuator: Push plate.
   3. Pull-Side Actuator: Proximity detector.
   4. Pull-Side Safety: Door-mounted.
   5. Hold Open: Toggle switch at inside head of doors; this is not a fire-rated door.
   6. Door and Frame Finish: Anodized, dark bronze.

2.04 CONTROLLERS, ACTUATORS, AND SAFETIES

A. Controller: Provide microprocessor operated controller for each door.

B. Comply with BHMA A156.10 for actuator and safety types and zones.

C. Proximity Detector Actuator/Safety: Microwave; distance of control sensitivity adjustable.

2.05 ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Electrical Characteristics:

B. Motors: NEMA MG 1.

C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

D. Disconnect Switch: Factory mount disconnect switch in control panel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work and dimensions are as indicated on shop drawings.

B. Verify that electric power is available and is of the correct characteristics.

3.02 INSTALLATION

A. Install equipment in accordance with manufacturer's instructions.

B. Provide for dimensional distortion of components during operation.

C. Coordinate installation of components with related and adjacent work; level and plumb.

3.03 ADJUSTING

A. Adjust door equipment for correct function and smooth operation.

3.04 CLOSEOUT ACTIVITIES

A. Demonstrate operation, operating components, adjustment features, and lubrication requirements.

3.05 MAINTENANCE

A. See Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide service and maintenance of operating equipment for one year from Date of Substantial Completion, at no extra charge to Owner.

END OF SECTION

SECTION 08 4313
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront with vision glass

B. Aluminum entrance doors and frames.

C. Weatherstripping.

1.02 RELATED REQUIREMENTS

A. Section 07 2500 - Weather Barriers: Sealing framing to weather barrier installed on adjacent construction.

B. Section 07 9005 - Joint Sealers: Perimeter sealant and back-up materials.

C. Section 08 4229 - Automatic Entrances.

D. Section 08 7100 - Door Hardware: Hardware items other than specified in this section.

E. Section 08 8000 - Glazing: Glass and glazing accessories.

F. Section 08 4413 - Glazed Aluminum Curtain Walls.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.

B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

G. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

H. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

D. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.

E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide 10 year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide 10 year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING

A. Center-Set Style, Thermally-Broken:
   1. Basis of Design: Kawneer Trifab 451.
   2. Vertical Mullion Dimensions: 2 inches wide by 6 inches deep.

B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
   1. EFCO, a Pella Company; _____: www.efcocorp.com/#sle.
   2. YKK AP America Inc: www.ykkap.com.

C. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.02 BASIS OF DESIGN -- SWINGING DOORS

A. Wide Stile, Monolithic Glazing:
   1. Basis of Design: Kawneer 500.
   2. Thickness: 1-3/4 inches.

B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
   1. C.R. Laurence Company, Inc; U.S. Aluminum; _____: www.crl-arch.com/#sle.
   2. EFCO, a Pella Company; _____: www.efcocorp.com/#sle.
   3. YKK AP America Inc; _____: www.ykkap.com/#sle.

C. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.
   1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.03 STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Finish: Class I color anodized. Dark Bronze
      a. Factory finish all surfaces that will be exposed in completed assemblies.

2. Fabrication: Joints and corners flush, hairline, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
3. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
4. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

B. Performance Requirements:
1. Live Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design load _____.
a. Design Wind Loads: Refer to project structural drawings load summary and comply with requirements of ASCE 7.
b. Member Deflection: Limit member deflection to L /360 in any direction, with full recovery of glazing materials.

2.04 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections
1. Glazing Stops: Flush.

B. Glazing: As specified in Section 08 8000.

C. Swing Doors: Glazed aluminum. Basis of design product "Kawneer 500"
1. Thickness: 1-3/4 inches.
2. Top Rail: 5 inches wide.
3. Vertical Stiles: 5 inches wide.
4. Bottom Rail: 10 inches wide.
5. Intermediate Rail: 6" wide
6. Glazing Stops: Square.
7. Finish: Same as storefront.

2.05 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Structural Steel Sections: ASTM A36/A36M; galvanized in accordance with requirements of ASTM A123/A123M.

C. Fasteners: Stainless steel.

D. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

E. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

2.06 FINISHES

A. Class I Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored anodic coating not less than 0.7 mils thick.

2.07 HARDWARE

A. For each exterior door, include weatherstripping at jambs,head and meeting rails.

B. Other Door Hardware: As specified in Section 08 7100.

C. Weatherstripping: Wool pile, continuous and replaceable; provide on all exterior doors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Install hardware using templates provided.
   1. See Section 08 7100 for hardware installation requirements.

F. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 ADJUSTING

A. Adjust operating hardware for smooth operation.

3.05 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Remove excess sealant by method acceptable to sealant manufacturer.

3.06 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 4413
GLAZED ALUMINUM CURTAIN WALLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed curtain wall, with vision glazing glass and metal

1.02 RELATED REQUIREMENTS

A. Section 07 2500 - Weather Barriers: Sealing framing to weather barrier installed on adjacent construction.

B. Section 07 8400 - Firestopping: Firestop at system junction with structure.

C. Section 07 9005 - Joint Sealers: Perimeter sealant and back-up materials.

D. Section 08 8000 - Glazing.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.

B. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems; 2014.

C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

D. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

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 B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

H. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

I. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).

J. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, internal drainage details, glazing, _____, and infill.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and attachement hardware securing system to metal stud framed openings and masonry openings.

D. Design Data: Provide framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations; include load calculations at points of attachment to building structure.

E. Test Reports: Submit results of full-size mock-up testing. Reports of tests previously performed on the same design are acceptable.

F. Design Data: Provide framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations; include load calculations at points of attachment to building structure.

G. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

H. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design curtain wall and its structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces. Do not expose to masonry mortar, uncured concrete, grout, alkid or acidic materials or processes. Protect finish from masonry cleaning operations.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide 10 year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide 10 year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN

A. Pressure Cap at Four Sides; Unitized and Thermally Enhanced:
   1. Basis of Design: Kawneer 1600 _____

B. Other Manufacturers: Provide either product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below.
   1. C.R. Laurence Company, Inc; U.S. Aluminum; _____: www.crl-arch.com/#sle.
   2. EFCO, a Pella Company; _____: www.efcocorp.com/#sle.
   3. YKK AP America Inc; _____: www.ykkap.com/#sle.

C. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.02 CURTAIN WALL

A. Aluminum-Framed Curtain Wall: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Finish: Class I color anodized. Dark Bronze
      a. Factory finish surfaces that will be exposed in completed assemblies.
      b. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.

2. Provide flush joints and corners, weathersealed, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.
3. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
4. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
5. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

B. Structural Performance Requirements: Design and size components to withstand the following load requirements without damage or permanent set.
1. Design Wind Loads: Design for loads indicated in project structural drawings.
a. Member Deflection: For spans less than 13 feet 6 inches, limit member deflection to flexure limit of glass in any direction, and maximum of 1/175 of span or 3/4 inch, whichever is less and with full recovery of glazing materials.
2. Movement: Accommodate the following movement without damage to components or deterioration of seals:
a. Expansion and contraction caused by 180 degrees F surface temperature.
b. Expansion and contraction caused by cycling temperature range of 170 degrees F over a 12 hour period.
c. Movement of curtain wall relative to perimeter framing.
d. Deflection of structural support framing, under permanent and dynamic loads.

C. Thermal Performance Requirements:
1. Condensation Resistance Factor of Framing: 70, minimum, measured in accordance with AAMA 1503.
2. Overall U-value Including Glazing: 0.29 Btu/(hr sq ft deg F), maximum.

2.03 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
1. Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel member.

B. Glazing: As specified in Section 08 8000.

C. Infill Panels: Insulated, aluminum sheet face and back, with edges formed to fit glazing channel and sealed.
1. Face Sheet:.032 inch thick.
2. Core: Rigid polystyrene insulation core with R-value of 10.
3. Back Sheet:.032 inch thick.
4. Exterior Finish: Class I color anodized.
5. Interior Finish: factory enamel in any color .

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209 (ASTM B209M).

C. Fasteners: Stainless steel; type as required or recommended by curtain wall manufacturer.

D. Exposed Flashings: 0.032 inch thick aluminum sheet; finish to match framing members.

E. Concealed Flashings: 0.032 inch thick aluminum.

F. Firestopping: As specified in Section 07 8400.

G. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

H. Glazing Accessories: As specified in Section 08 8000.

2.05 FINISHES

A. Class I Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored anodic coating not less than 0.7 mils thick.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other related work.

B. Verify that curtain wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

C. Verify that anchorage devices have been properly installed and located.

3.02 INSTALLATION

A. Install curtain wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Coordinate attachment and seal of perimeter air and vapor barrier materials.

H. Install firestopping at each floor slab edge.

I. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

J. Install perimeter sealant in accordance with Section 07 9005.

K. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 0.5 inches per 100 ft, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

C. Sealant Space Between Curtain Wall Mullions and Adjacent Construction: Maximum of 1/2 inch and minimum of 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.

B. Provide field testing of installed curtain wall system by independent laboratory in accordance with AAMA 503 during construction process and before installation of interior finishes.
   1. Perform a minimum of two tests, one at the North facing system & one at the South facing system. both test shall be performed on at the second floor or as directed by Architect.
   2. Conduct tests in each area prior to 50 percent completion of this work.
   3. Field test for water penetration in accordance with ASTM E1105 with uniform static air pressure difference (Procedure A) not less than 4.18 psf.
      a. Maximum allowable rate of water penetration in 15-minute test is 0.5 ounce that is not contained in an area with provisions to drain to exterior, or collected on surface of interior horizontal framing member.

C. Repair or replace curtain wall components that have failed designated field testing, and retest to verify performance conforms to specified requirements.

3.05 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Remove excess sealant by method acceptable to sealant manufacturer.

3.06 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 5659
SERVICE COUNTER WINDOW UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Service and teller window units.

B. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 9005 - Joint Sealers: Perimeter sealant and back-up materials.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate work with adjacent materials specified in other sections and as indicated on drawings and approved shop drawings.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's product data for specified products indicating materials, operation, glazing, finishes, and installation instructions.

C. Shop Drawings: Indicate configuration, sizes, rough-in, mounting, anchors and fasteners, and installation clearances.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with at least ten years documented experience, and with ability to provide test reports showing that their standard manufactured products meet the specified requirements.

B. 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. Deliver units in manufacturer's original packaging and unopened containers with identification labels intact.

B. Store units in area protected from exposure to weather and vandalism.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 SERVICE AND TELLER WINDOW UNITS

A. Pass-Through Window:
   1. Location: Interior.
   2. Forced Entry Resistance: Tested to meet ASTM F588 Grade 10 window and tempered glazing.
   3. Window: as indicated in project drawings .
      a. Operation: Manual, operating panels top supported on ball track system that will provide secure closure when locked.
      b. Mounting: Flush with the wall surface.
      c. Size: As indicated on drawings.
      d. Counter Space: Open counter with no bottom track at operating panels.
      e. Finish: Natural anodized.

4. Glazing: Single (monolithic), clear.
5. Locking: keyed lock at bottom track securing each operable panel through bottom frame.
6. Counter Staging Area: Laminated shelf on attendant-side and client side. Full width of window unit, 18" total depth centered over wall framing. Laminate color selected by architect from HPL mfg. full range.
7. Products:
   a. C.R. Laurence , DW series .
   b. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.02 ASSEMBLY COMPONENTS

A. Windows: Factory-fabricated, finished, and glazed, with extruded aluminum frame and glazing stops; complete with hardware and anchors.
   1. Provide window units that are re-glazable from the secure side without dismantling the non-secure side of framing.
   2. Rigidly fit and secure joints and corners with internal reinforcement. Make joints and connections flush, hairline, and weatherproof. Fully weld corners.
   3. Apply factory finish to exposed surfaces.
   4. Horizontal Sliding Windows: Top-hung operable sash; with thumb-turn release and drop down security bar.

2.03 MATERIALS

A. Aluminum Extrusions: Minimum 1/8 inch thick frame and sash material complying with ASTM B221 and ASTM B221M.
   1. Anodized Aluminum Surfaces: Clear Architectural Class II, minimum 0.7 mils medium matte chemical finish, conforming to AAMA 611.

B. Monolithic Glass: Fully tempered float glass; minimum 1/4 inch thickness.

2.04 ACCESSORIES

A. Hardware and Security Devices for Sliding Windows:
   1. Night Security Lock Bar: Sliding aluminum lock bar.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that window openings are ready for installation of windows.

B. Verify that correct embedded anchors are in place and in proper location; repair or replace anchors as required to achieve satisfactory installation.

C. Notify Architect if conditions are not suitable for installation of units; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install units in correct orientation (inside/outside or secure/non-secure).

C. Anchor units securely in manner so as to achieve performance specified.

D. Seal perimeter joints as specified in Section 07 9005.

3.03 ADJUSTING

A. Adjust operating components for smooth operation while also maintaining a secure, weather-tight enclosure and a tight fit at the contact points; lubricate operating hardware.

3.04 CLEANING

A. Remove protective material from factory finished surfaces.

B. Clean exposed surfaces promptly after installation without damaging finishes.

C. Remove and replace defective work.

D. Provide temporary protection to ensure that security windows are without damage at time of Substantial Completion.

3.05 PROTECTION

A. Provide temporary protection to ensure that service window is without damage upon Date of Substantial Completion.

END OF SECTION

SECTION 087100
DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Sliding doors.
3. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Automatic operators.

C. Related Sections:

1. Division 08 Section “Hollow Metal Doors and Frames”.
2. Division 08 Section “Flush Wood Doors”.
3. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.
4. Division 08 Section “Automatic Door Operators”.
5. Division 28 Section “Access Control”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. UL/ULC and CSA C22.2 – Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
8. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards:

1. ANSI/BHMA Certified Product Standards - A156 Series
2. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

    a. Type, style, function, size, label, hand, and finish of each door hardware item.
    b. Manufacturer of each item.
    c. Fastenings and other pertinent information.
    d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    e. Explanation of abbreviations, symbols, and codes contained in schedule.
    f. Mounting locations for door hardware.
    g. Door and frame sizes and materials.
    h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

a. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

D. Automatic Operator Supplier Qualifications: Power operator products and accessories are required to be supplied and installed through current members of the manufacturer's "Power Operator Preferred Installer" program. Suppliers are to be factory trained, certified, and a direct purchaser of the specified power operators and be responsible for the installation and maintenance of the units and accessories indicated for the Project.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:

1. Ten years for mortise locks and latches.
2. Seven years for heavy duty cylindrical (bored) locks and latches.
3. Five years for exit hardware.
4. Twenty five years for manual surface door closer bodies.
5. Five years for motorized electric latch retraction exit devices.
6. Two years for electromechanical door hardware.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

    a. Two Hinges: For doors with heights up to 60 inches.
    b. Three Hinges: For doors with heights 61 to 90 inches.
    c. Four Hinges: For doors with heights 91 to 120 inches.
    d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

    a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
    b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Manufacturers:

a. Hager Companies (HA) - CB Series.
b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - TA Series.
c. Stanley Hardware (ST) - CB Series.

2.3 POWER TRANSFER DEVICES

A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

a. Hager Companies (HA) - ETW-QC (# wires) Option.
b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - QC (# wires) Option.
c. Stanley Hardware (ST) – C Option.

B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:
a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Electrical Connecting Kit: QC-R001.
b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

a. Hager Companies (HA) - Quick Connect.
b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) – QC-C Series.
c. Stanley Hardware (ST) – WH Series.

2.4 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

5. Manufacturers:

a. Door Controls International (DC).
b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
c. Trimco (TC).

B. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

5. Manufacturers:

a. Hiawatha, Inc. (HI).
b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
c. Trimco (TC).

2.5 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Cylinders: Original manufacturer cylinders complying with the following:

1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
5. Keyway: Match Facility Restricted Keyway.

C. High Security Cylinders: ANSI/BHMA A156.5, Grade 1 High security cylinder conforming to UL437, including both pick and drill resistance. Pick resistance incorporates two or more independent locking mechanisms including a pin tumbler device with six top pin chambers, mushroom-shaped driver pins, and coded sidebar locking mechanism operated independently from the six top pin tumbler device. Drill resistance incorporates cylinder housing with fixed case-hardened inserts protecting the pin tumbler shear line, cylinder plugs with case-hardened inserts protecting both the pin tumbler shear line and the side bar, mushroom-shaped stainless steel driver pins, and stainless steel sidepins. Cylinders to be factory keyed.

1. Manufacturers:

a. ASSA (AA) – V10 Series.

D. Keying System: Each type of lock and cylinders to be factory keyed.

1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. Existing System: Key locks to Owner's existing system.

E. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

F. Construction Keying: Provide temporary keyed construction cores.

G. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.6 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

1. Mortise locks to be certified Security Grade 1.

2. Manufacturers:

    a. Corbin Russwin Hardware (RU) – ML2000 Series.
    b. Sargent Manufacturing (SA) – 8200 Series.
    c. Stanley Best (BE) – 40H-UN Series.

B. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Grade 1 certified.

1. Furnish with solid cast levers, standard 2 3/4” backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt.

2. Locks are to be non-handed and fully field reversible.

3. Extended cycle test: Locks to have been cycle tested in ordinance with ANSI/BHMA 156.2 requirements to 2 million cycles.

4. Manufacturers:

    a. Corbin Russwin Hardware (RU) – CL3300 Series.
    b. Sargent Manufacturing (SA) – 10 Line.
    c. Stanley Best (BE) – 9K Series.

2.7 ELECTROMECHANICAL LOCKING DEVICES

A. Electromechanical Mortise Locksets, Grade 1 (Heavy Duty): Subject to same compliance standards and requirements as mechanical mortise locksets, electrified locksets to be of type and design as specified below.

1. Electrified Lock Options: Where indicated in the Hardware Sets, provide electrified options including: outside door lock/unlock trim control, latchbolt and lock/unlock status monitoring, deadbolt monitoring, and request-to-exit signaling. Support end-of-line resistors contained within the lock case. Unless otherwise indicated, provide electrified locksets standard as fail secure.

2. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.

3. Manufacturers:

    a. Corbin Russwin Hardware (RU) - ML20900 Series.
    b. Sargent Manufacturing (SA) - 8200 Series.
    c. Stanley Best (BE) - 40HW EL/EU Series.

B. Electromechanical Cylindrical Locksets, Grade 1 (Heavy Duty): Subject to same compliance standards and requirements as mechanical cylindrical locksets, electrified locksets to be of type and design as specified below.

1. Electrified Lock Options: Where indicated in the Hardware Sets, provide electrified options including: outside door lock/unlock trim control, latchbolt and lock/unlock status monitoring, and request-to-exit signaling. Unless otherwise indicated, provide electrified locksets standard as fail secure.

2. Manufacturers:

a. Corbin Russwin Hardware (RU) - CL33900 Series.
b. Sargent Manufacturing (SA) - 10G70/71 Series.
c. Stanley Best (BE) - 93K EL/EU Series.

2.8 AUXILIARY LOCKS

A. Mortise Deadlocks, Large Case: ANSI/BHMA A156.13, Series 1000, Grade 1, certified large case mortise type deadlocks constructed of heavy gauge wrought corrosion resistant steel. One piece stainless steel bolts with a 1" throw. Deadlocks to be products of the same source manufacturer and keyway as other locksets.

1. Manufacturers:

a. Corbin Russwin Hardware (RU) - ML2000 Series.
b. Sargent Manufacturing (SA) - 8200 Series.
c. Stanley Best (BE) - 47H Series.

2.9 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.10 ELECTRIC STRIKES

A. Standard Electric Strikes: Heavy duty, cylindrical and mortise lock electric strikes conforming to ANSI/BHMA A156.31, Grade 1, UL listed for both Burglary Resistance and for use on fire rated door assemblies. Stainless steel construction with dual interlocking plunger design tested to exceed 3000 lbs. of static strength and 350 ft-lbs. of dynamic strength. Strikes tested for a minimum 1 million operating cycles. Provide strikes with 12 or 24 VDC capability and supplied standard as fail-secure unless otherwise specified. Provide latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike where specified.

1. Manufacturers:

    a. Folger Adam EDC (FO).
    b. HES (HS).
    c. Von Duprin (VD).

B. Provide electric strikes with in-line power controller and surge suppressor by the same manufacturer as the strike with the combined products having a five year warranty.

2.11 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.

2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.

3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.

5. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.

6. Electromechanical Options: Subject to same compliance standards and requirements as mechanical exit devices, electrified devices to be of type and design as specified in

hardware sets. Include any specific controllers when conventional power supplies are not sufficient to provide the proper inrush current.

7. Motorized Electric Latch Retraction: Devices with an electric latch retraction feature must use motors which have a maximum current draw of 600mA. Solenoid driven latch retraction is not acceptable.

8. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

9. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.

10. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.

11. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.

12. Rail Sizing: Provide exit device rails factory sized for proper door width application.

13. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.

1. Manufacturers:

    a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
    b. Sargent Manufacturing (SA) - 80 Series.
    c. Von Duprin (VD) - 35A/98 XP Series.

C. Tube Steel Removable Mullions: ANSI/BHMA A156.3 removable steel mullions with malleable-iron top and bottom retainers and a primed paint finish.

1. Provide keyed removable feature where specified in the Hardware Sets.

2. Provide stabilizers and mounting brackets as required.

3. Provide electrical quick connection wiring options as specified in the hardware sets.

4. Manufacturers:

    a. Corbin Russwin Hardware (RU) - 700/900 Series.

b. Sargent Manufacturing (SA) - 980S Series.
c. Von Duprin (VD) - 9954 Series.

2.12 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.

2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.

4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.

5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Manufacturers:

a. Corbin Russwin Hardware (RU) - DC6000 Series.
b. LCN Closers (LC) - 4040 Series.
c. Norton Door Controls (NO) - 7500 Series.

C. Door Closers, Surface Mounted (Unitrol): Unitrol arms to have door stop mechanism to absorb dead stop shock on arm and top hinge. Hold-open arms to have a spring loaded mechanism in

addition to shock absorber assembly. Arms to be provided with rigid steel main arm and secondary arm lengths proportional to the door width.

1. Manufacturers:

    a. Corbin Russwin Hardware (RU) - Unitrol Series.
    b. Norton Door Controls (NO) - Unitrol Series.

2.13 ELECTROHYDRAULIC DOOR OPERATORS

A. General: Provide low energy operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for compliance with UL 325. Coordinate operator mechanisms with door operation, hinges, and activation devices.

1. Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.

B. Standard: Certified ANSI/BHMA A156.19.

C. Performance Requirements:

1. Opening Force if Power Fails: Not more than 15 lbf required to release a latch if provided, not more than 30 lbf required to manually set door in motion, and not more than 15 lbf required to fully open door.
2. Entrapment Protection: Not more than 15 lbf required to prevent stopped door from closing or opening.

D. Configuration: Surface mounted or in-ground as required. Door operators to control single swinging and pair of swinging doors.

E. Operation: Power opening and spring closing operation capable of meeting ANSI A117.1 accessibility guideline. Provide time delay for door to remain open before initiating closing cycle as required by ANSI/BHMA A156.19. When not in automatic mode, door operator to function as manual door closer with fully adjustable opening and closing forces, with or without electrical power.

F. Features: Operator units to have full feature adjustments for door opening and closing force and speed, backcheck, motor assist acceleration from 0 to 30 seconds, time delay, vestibule interface delay, obstruction recycle, and hold open time from 0 up to 30 seconds.

G. Provide outputs and relays on board the operator to allow for coordination of exit device latch retraction, electric strikes, magnetic locks, card readers, safety and motion sensors and specified auxiliary contacts.

H. Brackets and Reinforcements: Manufacturer's standard, fabricated from aluminum with nonferrous shims for aligning system components.

I. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. LCN Closers (LC) - 4640 Series.
2. Norton Door Controls (NO) - 6000 Series.
3. Stanley Security Solutions (ST) – D-4990 Series.

2.14 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.

2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.

4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:

    a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.

6. Manufacturers:

    a. Hager Companies (HA).
    b. Hiawatha, Inc. (HI).
    c. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

2.15 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

    a. Hiawatha, Inc. (HI).
    b. Ives (IV).
    c. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:

    a. Glynn Johnson (GJ).
    b. Rixson Door Controls (RF).
    c. Sargent Manufacturing (SA).

2.16 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. National Guard Products (NG).
2. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).

3. Reese Enterprises, Inc. (RE).

2.17 ELECTRONIC ACCESSORIES

A. Key Switches: Key switches furnished standard with stainless steel single gang face plate with a 12/24VDC bi-color LED indicator. Integral backing bracket permits integration with any 1 1/4" or 1 1/2" mortise type cylinder. Key switches available as momentary or maintained action and in narrow face plate options.

1. Manufacturers:

a. Security Door Controls (SD) - 800 Series.
b. Securitron (SU) - MK Series.

2.18 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.19 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Power Operator products and accessories are required to be installed through current members of the manufacturer's "Power Operator Preferred Installer" program.

D. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

B. The supplier is responsible for handing and sizing all products and providing the correct option for the appropriate door type and material where more than one is presented in the hardware sets. Quantities listed are for each pair of doors, or for each single door.

C. Manufacturer’s Abbreviations:

1. MK - McKinney
2. RO - Rockwood
3. RU - Corbin Russwin
4. AA - ASSA High Security Locks
5. FO - Folger Adam
6. HS - HES
7. RF - Rixson
8. NO - Norton
9. NG - National Guard
10. PE - Pemko
11. SA - SARGENT
12. HD - HID
13. SU - Securitron
14. OT - OTHER

Hardware Sets

Set: 1.0

Doors: 1000C
Description: Exterior Aluminum Exit Only

3	Hinge (heavy weight)	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK
1	Exit Device (exit only)	ED5200 EO M51	630	RU
1	Surface Closer (uni)	DC6210 A11 M54 M75 M77	689	RU
1	Threshold	896HDP SIA x Door Width		NG
1	Sweep	315CN TKSP x Door Width		PE
1	Door Position Switch	By Div 28 Subcontractor		SA

Notes: Perimeter gasket by frame manufacturer.
Door contact switch indicates propped door condition.

Set: 2.0

Doors: 1020A
Description: Exterior Aluminum Card Access Exit

2	Hinge (heavy weight)	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK
1	Hinge (heavy weight)	T4A3386 QC12 4-1/2" x 4-1/2"	US32D	MK ⚡
1	Exit Device (nightlatch,ELR,RX)	ED5200 K157ET M92 M51 MELR	630	RU ⚡

1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Door Pull	BF157 Mtg-Type 1	US32D	RO
1	Surface Closer (uni)	DC6210 A11 M54 M75 M77	689	RU
1	Threshold	896HDP SIA x Door Width		NG
1	Sweep	315CN TKSP x Door Width		PE
1	Door Position Switch	By Div 28 Subcontractor		SA
1	ElectroLynx Harness	QC-C012 Hinge to Device Rail		MK ⚡
1	ElectroLynx Harness	QC-C3000P Hinge to Panel		MK ⚡
1	Wall Card Reader	SE-RP40 By Div 28 Sub	BLK	HD ⚡
1	Power Supply	BPS-24 By Div 28 Sub		SU ⚡

Notes: Perimeter gasket by frame manufacturer.
Door contact switch indicates propped door condition.
Access control panel and security software by security contractor.
Prep door and hinge jamb for electromechanical device.
OPERATION: Card reader outside temporarily retracts latchbolt - auto relock. Device is fail-secure with inside RX switch and outside key override. Inside pushbar always allows egress.

Set: 3.0

Doors: 1000B

Description: Exterior Aluminum Exit Only Pair

6	Hinge (heavy weight)	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK
1	Removable Mullion	CR907BKM 7'		RU
2	Exit Device (exit only)	ED5200 EO M51	630	RU
1	Cylinder (temp,mullion)	CR1000-114	626	RU
2	Cylinder As Required	Mortise Rim or K I L	626	AA
2	Surface Closer (uni)	DC6210 A11 M54 M75 M77	689	RU
1	Threshold	896HDP SIA x Door Width		NG
2	Sweep	315CN TKSP x Door Width		PE
2	Door Position Switch	By Div 28 Subcontractor		SA
1	Motion Sensor	XMS		SU ⚡

Notes: Perimeter gasket by frame manufacturer.
Door position is monitored by magnetic switch for authorized egress.

Set: 4.0

Doors: 1000A

Description: Exterior Aluminum Card Access Exit Pair + ADA Operator

5	Hinge (heavy weight)	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK	
2	Hinge (heavy weight)	T4A3386 QC12 4-1/2" x 4-1/2"	US32D	MK	⚡
2	Exit Device (exit only,elect latch retract)	ED5860 EO M92 MELR	630	RU	
2	Door Pull	BF157 Mtg-Type 1	US32D	RO	
2	Surface Closer (uni)	DC6210 A11 M54 M75 M77	689	RU	
1	Door Operator	6070 D SN-134	689	NO	⚡
1	Threshold	896HDP SIA x Door Width		NG	
2	Sweep	315CN TKSP x Door Width		PE	
2	Door Position Switch	By Div 28 Subcontractor		SA	
1	ElectroLynx Harness	QC-C012 Hinge to Device Rail		MK	⚡
1	ElectroLynx Harness	QC-C3000P Hinge to Panel		MK	⚡
1	Wall Card Reader	SE-RP40 By Div 28 Sub	BLK	HD	⚡
1	ADA Pushpad	506		NO	⚡
1	Motion Sensor	XMS		SU	⚡
1	Power Supply	BPS-24 By Div 28 Sub		SU	⚡

Notes: Perimeter gasket by frame manufacturer.
Door position is monitored by magnetic switch for authorized egress.
NOTE: Access control panel and security management software by security integrator.
Prep door and hinge jamb for electromechanical device.
OPERATION: OPEN HOURS: Both devices are switched to push pull with latches retracted by door control panel timer & outside actuator is activated.
AFTER HOURS: Card Reader outside retracts latchbolt at active leaf. Inside ADA pushpad retract latchbolt and cycle operator at active leaf.
Electronic device function is fail-secure with inside RX switch in rail. Inside rail always allows egress.

Set: 5.0

Doors: 1080A

Description: Rated Classroom Function Exit

3	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Fire Exit Device (classroom)	ED5200A N955ET	630	RU
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surf Overhead Stop	9-X36	652	RF
1	Surface Closer (reg)	DC6200	689	RU
1	Kick Plate	K1050 12" High CSK	US32D	RO
1	Perimeter Gasketing	S88BL x Head & Jambs		PE

Set: 6.0

Doors: 2202A
Description: Rated Classroom Function Exit

3	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Fire Exit Device (classroom)	ED5200A N955ET	630	RU
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surface Closer (HDPA)	DC6210 A3 M54	689	RU
1	Kick Plate	K1050 12" High CSK	US32D	RO
1	Wall Stop	409	US32D	RO
1	Perimeter Gasketing	S88BL x Head & Jambs		PE

Set: 7.0

Doors: 2200A, 2200B
Description: Rated Classroom Function Exit

3	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Fire Exit Device (classroom)	ED5200A N955ET	630	RU
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surface Closer (uni)	DC6210 A11 M54 M78	689	RU
1	Kick Plate	K1050 12" High CSK	US32D	RO
1	Perimeter Gasketing	S88BL x Head & Jambs		PE

Set: 8.0

Doors: 2070A
Description: Delayed Egress Exit

2	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Hinge	TA2714 QC12 4-1/2" x 4-1/2"	US26D	MK ⚡
1	Exit Device (del egress,storeroom)	ED5200 D N957ET M93	630C	RU ⚡
2	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surface Closer (HDPA)	DC6210 A3 M54	689	RU
1	Kick Plate	K1050 12" High CSK	US32D	RO
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO
1	Door Position Switch	By Div 28 Subcontractor		SA
1	ElectroLynx Harness	QC-C012 Hinge to Device Rail		MK ⚡
1	ElectroLynx Harness	QC-C3000P Hinge to Panel		MK ⚡
1	Wall Card Reader	SE-RP40 By Div 28 Sub	BLK	HD ⚡

1	Power Supply	BPS-24 By Div 28 Sub		SU ⚡

Notes: OPERATION: Pressing inside pushbar for more than one second sounds local alarm and starts an irreversible 15-second delay.(Subject to approval by local AHJ) During the delay cycle the latchbolt remains engaged & no egress is possible. Latch is released after delay, allowing egress. Inside card reader overrides delayed egress cycle and local alarm, allowing immediate egress. Outside lever allows ingress when unlocked by mechanical key and does not effect delay/alarm function. Inside cylinder resets alarm.

Set: 9.0

Doors: 2042A, 3034A

Description: Card Access Exit

2	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Hinge (heavy weight)	T4A3786 QC12 4-1/2" x 4-1/2"	US26D	MK ⚡
1	Exit Device (nightlatch)	ED5200 TH957ET M92 MELR M51	630	RU ⚡
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surface Closer (HDPA)	DC6210 A3 M54	689	RU
1	Kick Plate	K1050 12" High CSK	US32D	RO
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO
1	Door Position Switch	By Div 28 Subcontractor		SA
1	ElectroLynx Harness	QC-C012 Hinge to Device Rail		MK ⚡
1	ElectroLynx Harness	QC-C3000P Hinge to Panel		MK ⚡
1	Wall Card Reader	SE-RP40 By Div 28 Sub	BLK	HD ⚡
1	Power Supply	BPS-24 By Div 28 Sub		SU ⚡

Set: 10.0

Doors: 2020B, 3080A, 3080B

Description: Rated Card Access Exit - Fail-Safe

2	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Hinge	TA2714 QC12 4-1/2" x 4-1/2"	US26D	MK ⚡
1	Electric Exit Device (rim, fail safe)	ED5200A N9903ET M92	630	RU ⚡
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surface Closer (reg)	DC6200 M54	689	RU
1	Kick Plate	K1050 12" High CSK	US32D	RO
1	Wall Stop	409	US32D	RO
1	Perimeter Gasketing	S88BL x Head & Jambs		PE
1	Door Position Switch	By Div 28 Subcontractor		SA

1	ElectroLynx Harness	QC-C3000P Hinge to Panel		MK ⚡
1	ElectroLynx Harness	QC-C300 Hinge to Lock Body		MK ⚡
1	Wall Card Reader	SE-RP40 By Div 28 Sub	BLK	HD ⚡
1	Power Supply	BPS-24 By Div 28 Sub		SU ⚡

Notes: Door contact switch indicates propped door condition.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-safe with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 11.0

Doors: 1120B

Description: Rated Card Access Exit

3	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
3	Hinge (heavy weight)	T4A3786 QC12 4-1/2" x 4-1/2"	US26D	MK ⚡
1	Electric Exit Device (rim, fail secure)	ED5200A N9905ET M92	630	RU ⚡
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surface Closer (uni)	DC6210 A11 M54 M78	689	RU
1	Kick Plate	K1050 12" High CSK	US32D	RO
1	Perimeter Gasketing	S88BL x Head & Jambs		PE
1	Door Position Switch	By Div 28 Subcontractor		SA
1	ElectroLynx Harness	QC-C3000P Hinge to Panel		MK ⚡
1	ElectroLynx Harness	QC-C300 Hinge to Lock Body		MK ⚡
1	Wall Card Reader	SE-RP40 By Div 28 Sub	BLK	HD ⚡
1	Power Supply	BPS-24 By Div 28 Sub		SU ⚡

Notes: Door contact switch indicates propped door condition.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-secure with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 12.0

Doors: 1020B, 2020A, 2080A

Description: Rated Passage Function Exit

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK	
1	Exit Device (passage)	ED5200A N910ET	630	RU	
1	Surface Closer (reg)	DC6200 M54	689	RU	
1	Kick Plate	K1050 12" High CSK	US32D	RO	
1	Wall Stop	409	US32D	RO	
1	Perimeter Gasketing	S88BL x Head & Jambs		PE	

Set: 13.0

Doors: 2100E

Description: Rated Classroom Function Exit Pair - Electric Dogging

4	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK	
2	Hinge (heavy weight)	T4A3786 QC12 4-1/2" x 4-1/2"	US26D	MK	⚡
2	Exit Device (SVR,classroom,elect dog)	ED5400A N955ET M55 M97	630	RU	⚡
1	Cylinder (temp,mullion)	CR1000-114	626	RU	
2	Cylinder As Required	Mortise Rim or K I L	626	AA	
2	Surface Closer (uni)	DC6210 A11 M54 M78	689	RU	
2	Kick Plate	K1050 12" High CSK	US32D	RO	
1	Perimeter Gasketing	S88BL x Head & Jambs		PE	
1	Astragal Seal	S771BL x Door Height		PE	
2	ElectroLynx Harness	QC-C012 Hinge to Device Rail		MK	⚡
2	ElectroLynx Harness	QC-C3000P Hinge to Panel		MK	⚡
1	Keyswitch	MKA		SU	⚡
1	Power Supply	BPS-24 By Div 28 Sub		SU	⚡

Set: 14.0

Doors: 1030A, 1120A, 1200B, 2030A

Description: Rated Card Access Exit Pair

5	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK	
1	Hinge (heavy weight)	T4A3786 QC12 4-1/2" x 4-1/2"	US26D	MK	⚡
1	Removable Mullion	CR907BKM 7'		RU	
1	Electric Exit Device (rim, fail secure)	ED5200A N9905ET M92	630	RU	⚡
1	Exit Device (exit only)	ED5200A EO	630C	RU	
1	Cylinder (temp,mullion)	CR1000-114	626	RU	
2	Cylinder As Required	Mortise Rim or K I L	626	AA	
2	Surface Closer (uni)	DC6210 A11 M54 M78	689	RU	

2	Kick Plate	K1050 12" High CSK	US32D	RO
1	Perimeter Gasketing	S88BL x Head & Jambs		PE
1	Astragal Seal	S771BL x Door Height		PE
1	Door Position Switch	By Div 28 Subcontractor		SA
1	ElectroLynx Harness	QC-C3000P Hinge to Panel		MK ⚡
1	ElectroLynx Harness	QC-C300 Hinge to Lock Body		MK ⚡
1	Wall Card Reader	SE-RP40 By Div 28 Sub	BLK	HD ⚡
1	Power Supply	BPS-24 By Div 28 Sub		SU ⚡

Notes: Door contact switch indicates propped door condition.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-secure with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 15.0

Doors: 1070A, 2100C
Description: Card Access Exit Pair

5	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Hinge (heavy weight)	T4A3786 QC12 4-1/2" x 4-1/2"	US26D	MK ⚡
1	Removable Mullion	CR907BKM 7'		RU
1	Exit Device (exit only)	ED5200 EO M51	630	RU
1	Exit Device (nightlatch)	ED5200 TH957ET M92 MELR M51	630	RU ⚡
1	Cylinder (temp,mullion)	CR1000-114	626	RU
1	Cylinder As Required	Mortise Rim or K I L	626	AA
2	Surface Closer (uni)	DC6210 A11 M54 M78	689	RU
2	Kick Plate	K1050 12" High CSK	US32D	RO
2	Silencer	608-RKW		RO
1	Door Position Switch	By Div 28 Subcontractor		SA
1	ElectroLynx Harness	QC-C3000P Hinge to Panel		MK ⚡
1	ElectroLynx Harness	QC-C300 Hinge to Lock Body		MK ⚡
1	Wall Card Reader	SE-RP40 By Div 28 Sub	BLK	HD ⚡
1	Power Supply	BPS-24 By Div 28 Sub		SU ⚡

Notes: Door contact switch indicates propped door condition.
Access control panel and security software by security contractor.
Prep door and hinge jamb for electromechanical device.

OPERATION: Card reader outside temporarily retracts latchbolt - auto relock. Device is fail-secure with inside RX switch and outside key override. Inside pushbar always allows egress.

Set: 16.0

Doors: 2088A
Description: Storeroom Function Exit

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Exit Device (storeroom)	ED5200 N957ET M93 M51	630C	RU ⚡
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surface Closer (HDPA)	DC6210 A3 M54	689	RU
1	Kick Plate	K1050 12" High CSK	US32D	RO
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO

Set: 17.0

Doors: 1112A, 1117A, 1205B, 1208A, 1212A, 2073A, 2084E, 2084H, 2100A, 2100B
Description: Classroom Function

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Classroom Lock	CL3355 NZD	626	RU
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO

Set: 18.0

Doors: 3046A
Description: Classroom Function + O H Stop

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Classroom Lock	CL3355 NZD	626	RU
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surf Overhead Stop	9-X36	652	RF
3	Silencer	608-RKW		RO

Set: 19.0

Doors: 2070B, 2203A, 3200A
Description: Classroom Function + Closer

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Classroom Lock	CL3355 NZD	626	RU
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surface Closer (reg)	DC6200 M54	689	RU
1	Kick Plate	K1050 12" High CSK	US32D	RO
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO

Set: 20.0

Doors: 3014A
Description: Classroom Function + Closer

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Classroom Lock	CL3355 NZD	626	RU
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surface Closer (uni)	DC6210 A11 M54 M78	689	RU
1	Kick Plate	K1050 12" High CSK	US32D	RO
3	Silencer	608-RKW		RO

Set: 21.0

Doors: 1077A, 2064A, 2115A, 3104A, 3209A
Description: Classroom Function + Closer

3	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Classroom Lock	CL3355 NZD	626	RU
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surface Closer (reg)	DC6200 M54	689	RU
1	Kick Plate	K1050 12" High CSK	US32D	RO
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO

Set: 22.0

Doors: 2092A, 2117C, 3202A
Description: Classroom Function + Closer + O H Stop

3	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Classroom Lock	CL3355 NZD	626	RU
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surf Overhead Stop	9-X36	652	RF
1	Surface Closer (reg)	DC6200	689	RU

1	Kick Plate	K1050 12" High CSK	US32D	RO
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO

Set: 23.0

Doors: 1033A
Description: Classroom Function + Closer

3	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Classroom Lock	CL3355 NZD	626	RU
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surface Closer (HDPA)	DC6210 A3 M54	689	RU
1	Kick Plate	K1050 12" High CSK	US32D	RO
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO

Set: 24.0

Doors: 1091A, 2117A, 2134A
Description: Classroom Function + Closer

3	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Classroom Lock	CL3355 NZD	626	RU
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surface Closer (uni)	DC6210 A11 M54 M78	689	RU
1	Kick Plate	K1050 12" High CSK	US32D	RO
3	Silencer	608-RKW		RO

Set: 25.0

Doors: 1074A, 1092A, 1093A, 1094A, 1207A, 2065A, 3208A
Description: Card Access + Closer

2	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Hinge	TA2714 QC12 4-1/2" x 4-1/2"	US26D	MK ⚡
1	Fail Secure Lock	CL33905 NZD M92	626	RU ⚡
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surface Closer (reg)	DC6200 M54	689	RU
1	Kick Plate	K1050 12" High CSK	US32D	RO
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO
1	Door Position Switch	By Div 28 Subcontractor		SA

1	ElectroLynx Harness	QC-C3000P Hinge to Panel		MK ⚡
1	ElectroLynx Harness	QC-C300 Hinge to Lock Body		MK ⚡
1	Wall Card Reader	SE-RP40 By Div 28 Sub	BLK	HD ⚡
1	Power Supply	BPS-24 By Div 28 Sub		SU ⚡

Notes: Door contact switch indicates propped door condition.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-secure with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 26.0

Doors: 2080C
Description: Rated Card Access - Fail Safe

2	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Hinge	TA2714 QC12 4-1/2" x 4-1/2"	US26D	MK ⚡
1	Fail Safe Lock	CL33903 NZD 24AD M92	626	RU ⚡
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surface Closer (reg)	DC6200 M54	689	RU
1	Kick Plate	K1050 12" High CSK	US32D	RO
1	Wall Stop	409	US32D	RO
1	Perimeter Gasketing	S88BL x Head & Jambs		PE
1	Door Position Switch	By Div 28 Subcontractor		SA
1	ElectroLynx Harness	QC-C3000P Hinge to Panel		MK ⚡
1	ElectroLynx Harness	QC-C300 Hinge to Lock Body		MK ⚡
1	Wall Card Reader	SE-RP40 By Div 28 Sub	BLK	HD ⚡
1	Power Supply	BPS-24 By Div 28 Sub		SU ⚡

Notes: Door contact switch indicates propped door condition.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-safe with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 27.0

Doors: 1205A, 2014A, 2201A

Description: Card Access + Closer

2	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK	
1	Hinge	TA2714 QC12 4-1/2" x 4-1/2"	US26D	MK	⚡
1	Fail Secure Lock	CL33905 NZD M92	626	RU	⚡
1	Cylinder As Required	Mortise Rim or K I L	626	AA	
1	Surface Closer	DC6210 M54	689	RU	
1	Kick Plate	K1050 12" High CSK	US32D	RO	
1	Wall Stop	409	US32D	RO	
3	Silencer	608-RKW		RO	
1	Door Position Switch	By Div 28 Subcontractor		SA	
1	ElectroLynx Harness	QC-C3000P Hinge to Panel		MK	⚡
1	ElectroLynx Harness	QC-C300 Hinge to Lock Body		MK	⚡
1	Wall Card Reader	SE-RP40 By Div 28 Sub	BLK	HD	⚡
1	Power Supply	BPS-24 By Div 28 Sub		SU	⚡

Notes: Door contact switch indicates propped door condition.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-secure with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 28.0

Doors: 3014B, 3018A, 3207A

Description: Card Access + Closer

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK	
3	Hinge	TA2714 QC12 4-1/2" x 4-1/2"	US26D	MK	⚡
1	Fail Secure Lock	CL33905 NZD M92	626	RU	⚡
1	Cylinder As Required	Mortise Rim or K I L	626	AA	
1	Surface Closer (uni)	DC6210 A11 M54 M78	689	RU	
1	Kick Plate	K1050 12" High CSK	US32D	RO	
3	Silencer	608-RKW		RO	
1	Door Position Switch	By Div 28 Subcontractor		SA	
1	ElectroLynx Harness	QC-C3000P Hinge to Panel		MK	⚡
1	ElectroLynx Harness	QC-C300 Hinge to Lock Body		MK	⚡
1	Wall Card Reader	SE-RP40 By Div 28 Sub	BLK	HD	⚡

1	Power Supply	BPS-24 By Div 28 Sub		SU ⚡

Notes: Door contact switch indicates propped door condition.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-secure with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 29.0

Doors: 1083A, 1083B, 1096A, 1209A, 2004B, 2062B, 3027B
Description: Card Access + Closer

2	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Hinge (heavy weight)	T4A3786 QC12 4-1/2" x 4-1/2"	US26D	MK ⚡
1	Fail Secure Lock	CL33905 NZD M92	626	RU ⚡
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surface Closer (reg)	DC6200 M54	689	RU
1	Kick Plate	K1050 12" High CSK	US32D	RO
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO
1	Door Position Switch	By Div 28 Subcontractor		SA
1	ElectroLynx Harness	QC-C3000P Hinge to Panel		MK ⚡
1	ElectroLynx Harness	QC-C300 Hinge to Lock Body		MK ⚡
1	Wall Card Reader	SE-RP40 By Div 28 Sub	BLK	HD ⚡
1	Power Supply	BPS-24 By Div 28 Sub		SU ⚡

Notes: Door contact switch indicates propped door condition.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-secure with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 30.0

Doors: 2032A
Description: Card Access + Closer + O H Stop

2	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK

1	Hinge (heavy weight)	T4A3786 QC12 4-1/2" x 4-1/2"	US26D	MK ⚡
1	Fail Secure Lock	CL33905 NZD M92	626	RU ⚡
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surf Overhead Stop	9-X36	652	RF
1	Surface Closer (reg)	DC6200	689	RU
1	Kick Plate	K1050 12" High CSK	US32D	RO
3	Silencer	608-RKW		RO
1	Door Position Switch	By Div 28 Subcontractor		SA
1	ElectroLynx Harness	QC-C3000P Hinge to Panel		MK ⚡
1	ElectroLynx Harness	QC-C300 Hinge to Lock Body		MK ⚡
1	Wall Card Reader	SE-RP40 By Div 28 Sub	BLK	HD ⚡
1	Power Supply	BPS-24 By Div 28 Sub		SU ⚡

Notes: Door contact switch indicates propped door condition.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-secure with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 31.0

Doors: 1101A, 1102B, 1122A, 3002B, 3019A, 3023B, 3201A

Description: Card Access + Closer

2	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Hinge (heavy weight)	T4A3786 QC12 4-1/2" x 4-1/2"	US26D	MK ⚡
1	Fail Secure Lock	CL33905 NZD M92	626	RU ⚡
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surface Closer (HDPA)	DC6210 A3 M54	689	RU
1	Kick Plate	K1050 12" High CSK	US32D	RO
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO
1	Door Position Switch	By Div 28 Subcontractor		SA
1	ElectroLynx Harness	QC-C3000P Hinge to Panel		MK ⚡
1	ElectroLynx Harness	QC-C300 Hinge to Lock Body		MK ⚡
1	Wall Card Reader	SE-RP40 By Div 28 Sub	BLK	HD ⚡
1	Power Supply	BPS-24 By Div 28 Sub		SU ⚡

Notes: Door contact switch indicates propped door condition.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-secure with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 32.0

Doors: 1030B, 1071A, 2070C, 3002A, 3023A, 3200B

Description: Card Access + Closer

2	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Hinge (heavy weight)	T4A3786 QC12 4-1/2" x 4-1/2"	US26D	MK ⚡
1	Fail Secure Lock	CL33905 NZD M92	626	RU ⚡
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surface Closer (uni)	DC6210 A11 M54 M78	689	RU
1	Kick Plate	K1050 12" High CSK	US32D	RO
3	Silencer	608-RKW		RO
1	Door Position Switch	By Div 28 Subcontractor		SA
1	ElectroLynx Harness	QC-C3000P Hinge to Panel		MK ⚡
1	ElectroLynx Harness	QC-C300 Hinge to Lock Body		MK ⚡
1	Wall Card Reader	SE-RP40 By Div 28 Sub	BLK	HD ⚡
1	Power Supply	BPS-24 By Div 28 Sub		SU ⚡

Notes: Door contact switch indicates propped door condition.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-secure with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 33.0

Doors: 1202A

Description: Card Reader - Unequal Pair

5	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Hinge (heavy weight)	T4A3786 QC12 4-1/2" x 4-1/2"	US26D	MK ⚡
2	Flush Bolt	555	US26D	RO
1	Dust Proof Strike	570	US26D	RO

1	Electrified Mortise Lock	ML20906-SEC NSA M92	626	RU	⚡
2	Cylinder As Required	Mortise Rim or K I L	626	AA	
2	Surface Closer (uni)	DC6210 A11 M54 M78	689	RU	
2	Kick Plate	K1050 12" High CSK	US32D	RO	
2	Wall Stop	409	US32D	RO	
2	Silencer	608-RKW		RO	
1	Door Position Switch	By Div 28 Subcontractor		SA	
1	ElectroLynx Harness	QC-C3000P Hinge to Panel		MK	⚡
1	ElectroLynx Harness	QC-C300 Hinge to Lock Body		MK	⚡
1	Wall Card Reader	SE-RP40 By Div 28 Sub	BLK	HD	⚡
1	Power Supply	BPS-24 By Div 28 Sub		SU	⚡

Notes: Door contact switch indicates propped door condition.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-secure with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 34.0

Doors: 1200A

Description: Card Reader Both Sides - (no exit)

2	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK	
1	Hinge (heavy weight)	T4A3786 QC12 4-1/2" x 4-1/2"	US26D	MK	⚡
1	Electrified Mortise Lock	ML20932-SEC NSA	626	RU	⚡
2	Cylinder As Required	Mortise Rim or K I L	626	AA	
1	Surface Closer (HDPA)	DC6210 A3 M54	689	RU	
1	Kick Plate	K1050 12" High CSK	US32D	RO	
1	Wall Stop	409	US32D	RO	
1	Perimeter Gasketing	S88BL x Head & Jambs		PE	
1	Door Position Switch	By Div 28 Subcontractor		SA	
1	ElectroLynx Harness	QC-C3000P Hinge to Panel		MK	⚡
1	ElectroLynx Harness	QC-C300 Hinge to Lock Body		MK	⚡
2	Wall Card Reader	SE-RP40 By Div 28 Sub	BLK	HD	⚡
1	Power Supply	BPS-24 By Div 28 Sub		SU	⚡

Notes: Door contact switch indicates propped door condition.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock. Mortise lock required for requested function.

OPERATION: Card Reader either side temporarily unlocks both levers: auto-relock. Electronic lock function is fail-secure. Both side have key override.

Set: 35.0

Description: Card Reader Both Sides - no Exit

2	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Hinge (heavy weight)	T4A3786 QC12 4-1/2" x 4-1/2"	US26D	MK ⚡
1	Electrified Mortise Lock	ML20932-SEC NSA	626	RU ⚡
2	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surface Closer (HDPA)	DC6210 A3 M54	689	RU
1	Kick Plate	K1050 12" High CSK	US32D	RO
1	Wall Stop	409	US32D	RO
1	Perimeter Gasketing	S88BL x Head & Jambs		PE
1	Door Position Switch	By Div 28 Subcontractor		SA
1	ElectroLynx Harness	QC-C3000P Hinge to Panel		MK ⚡
1	ElectroLynx Harness	QC-C300 Hinge to Lock Body		MK ⚡
2	Wall Card Reader	SE-RP40 By Div 28 Sub	BLK	HD ⚡
1	Power Supply	BPS-24 By Div 28 Sub		SU ⚡

Notes: Door contact switch indicates propped door condition.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock. Mortise lock required for requested function.
OPERATION: Card Reader either side temporarily unlocks both levers: auto-relock. Electronic lock function is fail-secure. Both side have key override.

Set: 36.0

Doors: 2114A, 2128A, 2131A, 3061D, 3214A

Description: Passage Function

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Passage Latch	CL3310 NZD	626	RU
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO

Set: 37.0

Doors: 3069A

Description: Passage Function + O H Stop

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK

1	Passage Latch	CL3310 NZD	626	RU
1	Surf Overhead Stop	9-X36	652	RF
3	Silencer	608-RKW		RO

Set: 38.0

Doors: 1075A, 1076A, 1098A, 1099A, 2021A, 2021B, 2063A, 2084A, 2084B, 2084C, 2084D, 2084G, 2093A, 3032D, 3044A, 3046B, 3047A, 3061A, 3061B, 3061C, 3061F, 3068A, 3208B, 3210A, 3213A, 3214B, 3215A, 3217A, 3218A, 3219A, 3220A, 3222A, 3223A

Description: Office - Entry Function

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Entrance Lock	CL3351 NZD	626	RU
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO

Set: 39.0

Doors: 3032C

Description: Office - Entry Function + O H Stop

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Entrance Lock	CL3351 NZD	626	RU
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surf Overhead Stop	9-X36	652	RF
3	Silencer	608-RKW		RO

Set: 40.0

Doors: 1206A

Description: Privacy Function

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Passage Latch	CL3310 NZD	626	RU
1	Mop Plate	K1050 6" High CSK	US32D	RO
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO
1	Coat Hook	796	US26D	RO

Set: 41.0

Doors: 2093B

Description: Privacy Function + O H Stop

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Privacy Lock	CL3320 NZD	626	RU
1	Surf Overhead Stop	9-X36	630	RF
1	Mop Plate	K1050 6" High CSK	US32D	RO
3	Silencer	608-RKW		RO
1	Coat Hook	796	US26D	RO

Set: 42.0

Doors: 1064A, 1066A, 1135A, 1210A, 2008A, 3204A
Description: Privacy Function + Closer

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Privacy Lock	CL3320 NZD	626	RU
1	Surface Closer (reg)	DC6200 M54	689	RU
1	Kick Plate	K1050 12" High CSK	US32D	RO
1	Mop Plate	K1050 6" High CSK	US32D	RO
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO

Set: 43.0

Doors: 1078A, 1211A, 2018A, 2206A, 2207A, 3003A, 3003B, 3205A, 3211A
Description: Privacy Function + Closer

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Privacy Lock	CL3320 NZD	626	RU
1	Surface Closer	DC6210 M54	689	RU
1	Kick Plate	K1050 12" High CSK	US32D	RO
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO

Set: 44.0

Doors: 2208A, 3212A
Description: Privacy Function + Closer

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Privacy Lock	CL3320 NZD	626	RU
1	Surface Closer (uni)	DC6210 A11 M54 M78	689	RU
1	Kick Plate	K1050 12" High CSK	US32D	RO
3	Silencer	608-RKW		RO

Set: 45.0

Doors: 1072A, 3015A, 3016A
Description: Push-Pull + Closer

3	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Push Plate	70F CSK	US32D	RO
1	Pull Plate	BF 111x70C Mtg-Type 1 CSK	US32D	RO
1	Surface Closer (reg)	DC6200 M54	689	RU
1	Kick Plate	K1050 12" High CSK	US32D	RO
1	Mop Plate	K1050 6" High CSK	US32D	RO
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO

Set: 46.0

Doors: 3201B
Description: Push-Pull + Closer

3	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Push Plate	70F CSK	US32D	RO
1	Pull Plate	BF 111x70C Mtg-Type 1 CSK	US32D	RO
1	Surface Closer (HDPA)	DC6210 A3 M54	689	RU
1	Kick Plate	K1050 12" High CSK	US32D	RO
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO

Set: 47.0

Doors: 2017A, 2128B, 3061E, 3061H
Description: Storeroom Function

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom Lock	CL3357 NZD	626C	RU
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO

Set: 48.0

Doors: 1073A, 1105A, 1204A
Description: Storeroom Function + O H Holder

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom Lock	CL3357 NZD	626C	RU
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surf Overhead Hold Open	9-X26	652	RF
3	Silencer	608-RKW		RO

Set: 49.0

Doors: 1120C, 2076A, 3059A
Description: Storeroom Function + Closer

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom Lock	CL3357 NZD	626C	RU
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surface Closer (reg)	DC6200 M54	689	RU
1	Kick Plate	K1050 12" High CSK	US32D	RO
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO

Set: 50.0

Doors: 3032B
Description: Storeroom Function + Closer + O H Stop

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom Lock	CL3357 NZD	626C	RU
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surf Overhead Hold Open	9-X26	652	RF
1	Surface Closer (reg)	DC6200	689	RU
1	Kick Plate	K1050 12" High CSK	US32D	RO
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO

Set: 51.0

Doors: 2071A
Description: Storeroom Function + Closer

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom Lock	CL3357 NZD	626C	RU
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surface Closer	DC6210 M54	689	RU
1	Wall Stop	409	US32D	RO

3	Silencer	608-RKW		RO

Set: 52.0

Doors: 1100A, 1118A, 2100D
Description: Storeroom Function + Closer

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom Lock	CL3357 NZD	626C	RU
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surface Closer (uni)	DC6210 A11 M54 M78	689	RU
3	Silencer	608-RKW		RO

Set: 53.0

Doors: 1200C
Description: Storeroom Function Pair

6	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
2	Flush Bolt	555	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Storeroom Lock	CL3357 NZD	626C	RU
1	Cylinder As Required	Mortise Rim or K I L	626	AA
2	Wall Stop	409	US32D	RO
1	Astragal	357SS TKSP x Door Height		PE
2	Silencer	608-RKW		RO

Set: 54.0

Doors: 2205A
Description: Storeroom Function Pair + Closer

6	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
2	Flush Bolt	555	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Storeroom Lock	CL3357 NZD	626C	RU
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surface Closer (reg)	DC6200 M54	689	RU
2	Kick Plate	K1050 12" High CSK	US32D	RO
2	Wall Stop	409	US32D	RO
1	Astragal	357SS TKSP x Door Height		PE
2	Silencer	608-RKW		RO

Notes: Install closer on active leaf.

Set: 55.0

Doors: 1203A
Description: Storeroom Function Pair + Closer

6	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
2	Flush Bolt	555	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Storeroom Lock	CL3357 NZD	626C	RU
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Surf Overhead Stop	9-X36	652	RF
1	Surface Closer (uni)	DC6210 A11 M54 M75 M77	689	RU
1	Perimeter Gasketing	S88BL x Head & Jambs		PE
1	Astragal Seal	S771BL x Door Height		PE
1	Astragal	357SS TKSP x Door Height		PE

Notes: Install closer on active leaf.

Set: 56.0

Doors: 1102A
Description: Passage Function + Closer

3	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Passage Latch	CL3310 NZD	626	RU
1	Surface Closer (reg)	DC6200 M54	689	RU
1	Kick Plate	K1050 12" High CSK	US32D	RO
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO

Set: 57.0

Doors: 2040A, 2060A
Description: Rated Card Access Exit - Existing Door & Frame - Fail-Safe

3	Hinge (heavy weight)	T4A3786 QC12 4-1/2" x 4-1/2"	US26D	MK ⚡
1	Electric Exit Device (rim, fail safe)	ED5200A N9903ET M92	630	RU ⚡
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Door Position Switch	By Div 28 Subcontractor		SA

1 ElectroLynx Harness	QC-C3000P Hinge to Panel		MK	⚡
1 ElectroLynx Harness	QC-C300 Hinge to Lock Body		MK	⚡
1 Wall Card Reader	SE-RP40 By Div 28 Sub	BLK	HD	⚡
1 Power Supply	BPS-24 By Div 28 Sub		SU	⚡

Notes: Balance of existing hardware to remain.
Verify new hardware compatibility with existing conditions.
Door contact switch indicates propped door condition.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-safe with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 58.0

Doors: 1064B, 3046C
Description: Cased Opening

1 No Hardware Required	Cased Opening Frame		OT	

Set: 59.0

Doors: 1003A, 1020C, 1032A, 1033B, 2003B, 2048B, 2062A, 3056A
Description: Electric Strike Replacement

1 Electric Strike	712-F-24D	630	FO	⚡
1 SMART Pac Bridge Rectifier	2005M3		HS	⚡
1 Door Position Switch	By Div 28 Subcontractor		SA	
1 Wall Card Reader	SE-RP40 By Div 28 Sub	BLK	HD	⚡
1 Power Supply	BPS-24 By Div 28 Sub		SU	⚡

Notes: Balance of existing hardware to remain.
Verify new hardware compatibility with existing conditions.
Door contact switch indicates propped door condition.
Access control panel and security management software by others.
Prep strike jamb for electrical component.
OPERATION: Outside card reader temporarily unlocks electric strike: automatic relock. Electric strike is fail-secure. Mechanical lock outside lever is always fixed. Outside key retracts latchbolt. Inside lever is always free.

Set: 60.0

Doors: 1025A, 1036A, 1036B, 1054A, 1065A, 1065B, 1069A, 1101B, 1119A, 2013A, 2043B, 2056B, 2066A, 2067A, 2088B, 2134B, 3029A

Description: Card Access - Existing Door & Frame

1	Hinge	TA2714 QC12 4-1/2" x 4-1/2"	US26D	MK ⚡
1	Fail Secure Lock	CL33905 NZD M92	626	RU ⚡
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Door Position Switch	By Div 28 Subcontractor		SA
1	ElectroLynx Harness	QC-C3000P Hinge to Panel		MK ⚡
1	ElectroLynx Harness	QC-C300 Hinge to Lock Body		MK ⚡
1	Wall Card Reader	SE-RP40 By Div 28 Sub	BLK	HD ⚡
1	Power Supply	BPS-24 By Div 28 Sub		SU ⚡

Notes: Balance of existing hardware to remain.
Verify new hardware compatibility with existing conditions.
Door contact switch indicates propped door condition. Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock. Provide wiring harness in door.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-secure with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 61.0

Doors: 3051A, 3052A, 3072A, 3083A

Description: Card Access - Existing Door & Frame

3	Hinge	TA2714 QC12 5" x 4-1/2"	US26D	MK ⚡
1	Fail Secure Lock	CL33905 NZD M92	626	RU ⚡
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Door Position Switch	By Div 28 Subcontractor		SA
1	Wall Card Reader	SE-RP40 By Div 28 Sub	BLK	HD ⚡
1	Power Supply	BPS-24 By Div 28 Sub		SU ⚡

Notes: Balance of existing hardware to remain.
Verify new hardware compatibility with existing conditions.
Door contact switch indicates propped door condition. Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock. Provide wiring harness in door.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-secure with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 62.0

Doors: 1070C, 1120D

Description: Card Reader Both Sides - Existing Door & Frame

1	Hinge	TA2714 QC12 4-1/2" x 4-1/2"	US26D	MK ⚡
1	Electrified Mortise Lock	ML20932-SEC NSA	626	RU ⚡
2	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Door Position Switch	By Div 28 Subcontractor		SA
1	ElectroLynx Harness	QC-C3000P Hinge to Panel		MK ⚡
1	ElectroLynx Harness	QC-C300 Hinge to Lock Body		MK ⚡
1	Wall Card Reader	SE-RP40 By Div 28 Sub	BLK	HD ⚡
1	Power Supply	BPS-24 By Div 28 Sub		SU ⚡

Notes: Balance of existing hardware to remain.
Verify new hardware compatibility with existing conditions.
Door contact switch indicates propped door condition. Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock. Mortise lock required for requested function.
OPERATION: Card Reader either side temporarily unlocks both levers: auto-relock. Electronic lock function is fail-secure. Both side have key override.

Set: 63.0

Doors: 2082A

Description: Card Access - Added Mortise Lock - Existing Door & Frame

1	Hinge (heavy weight)	T4A3786 QC12 4-1/2" x 4-1/2"	US26D	MK ⚡
1	Electrified Mortise Lock	ML20906-SEC NSA M92	626	RU ⚡
1	Cylinder As Required	Mortise Rim or K I L	626	AA
1	Door Position Switch	By Div 28 Subcontractor		SA
1	ElectroLynx Harness	QC-C3000P Hinge to Panel		MK ⚡
1	ElectroLynx Harness	QC-C300 Hinge to Lock Body		MK ⚡
1	Wall Card Reader	SE-RP40 By Div 28 Sub	BLK	HD ⚡
1	Power Supply	BPS-24 By Div 28 Sub		SU ⚡

Notes: Remove existing magnetic lock. Balance of existing hardware to remain.
Verify new hardware compatibility with existing conditions.
Door contact switch indicates propped door condition. Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock. Provide wiring harness in door.

OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-secure with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 64.0

Doors: 1080C

Description: Rated Card Access - Existing Door & Frame - Fail Safe

1	Hinge	TA2714 QC12 4-1/2" x 4-1/2"	US26D	MK ⚡
1	Fail Safe Lock	CL33903 NZD 24AD M92	626	RU ⚡
1	Perimeter Gasketing	S88BL x Head & Jambs		PE
1	Door Position Switch	By Div 28 Subcontractor		SA
1	ElectroLynx Harness	QC-C3000P Hinge to Panel		MK ⚡
1	ElectroLynx Harness	QC-C300 Hinge to Lock Body		MK ⚡
1	Wall Card Reader	SE-RP40 By Div 28 Sub	BLK	HD ⚡
1	Power Supply	BPS-24 By Div 28 Sub		SU ⚡

Notes: Door contact switch indicates propped door condition.

Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-safe with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 65.0

Doors: 1042A

Description: Asylum Function - Holding Cell

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Mortise Deadlock	ML2012	626	RU
1	Flush Pull (BTB,set)	94BTB	US26D	RO
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO

Set: 66.0

Doors: 1070B, 1122C

Description: Delayed Egress - Card Reader Both Sides

1	Hinge	TA2714 QC12 4-1/2" x 4-1/2"	US26D	MK ⚡

1	Electric Exit Device (fail sec,del egr)	ED5200 N9905ET M89	630	RU	⚡
1	Surface Closer (reg)	DC6200 M54	689	RU	
1	Kick Plate	K1050 12" High CSK	US32D	RO	
1	Wall Stop	409	US32D	RO	
3	Silencer	608-RKW		RO	
1	Door Position Switch	By Div 28 Subcontractor		SA	
1	ElectroLynx Harness	QC-C012 Hinge to Device Rail		MK	⚡
1	ElectroLynx Harness	QC-C3000P Hinge to Panel		MK	⚡
1	Wall Card Reader	SE-RP40 By Div 28 Sub	BLK	HD	⚡
1	Power Supply	BPS-24 By Div 28 Sub		SU	⚡

Notes: Balance of existing hardware to remain.
Verify new hardware compatibility with existing conditions.
Door contact switch indicates propped door condition. Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock.
OPERATION: Pressing inside pushbar for more than one second sounds local alarm and starts an irreversible 15-second delay.(Subject to approval by local AHJ) During the delay cycle the latchbolt remains engaged & no egress is possible. Latch is released after delay, allowing egress. Inside card reader overrides delayed egress cycle and local alarm. Outside reader unlocks outside lever & temporarily allows ingress and does not effect delay/alarm function. Inside cylinder resets alarm.

Set: 67.0

Doors: 1040A, 1060B

Description: Existing Rated Card Access Exit

3	Hinge	TA2714 QC12 5" x 4-1/2"	US26D	MK	⚡
1	Electric Exit Device (rim, fail secure)	ED5200A N9905ET M92	630	RU	⚡
1	Surface Closer (reg)	DC6200 M54	689	RU	
1	Wall Stop	409	US32D	RO	
1	ElectroLynx Harness	QC-C3000P Hinge to Panel		MK	⚡
1	ElectroLynx Harness	QC-C300 Hinge to Lock Body		MK	⚡
1	Wall Card Reader	SE-RP40 By Div 28 Sub	BLK	HD	⚡
1	Power Supply	BPS-24 By Div 28 Sub		SU	⚡

Notes: Balance of existing hardware to remain.
Verify new hardware compatibility with existing conditions.
Door contact switch indicates propped door condition. Security management software and access control panel by others.
Prep door and hinge jamb for electronic device.

OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-secure with inside RX switch. Outside trim has key override. Inside push bar always allows egress.

END OF SECTION 087100

SECTION 08 8000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.

B. Interior side light, door lite, transom glass

C. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 2500 - Weather Barriers.

B. Section 08 1113 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.

C. Section 08 1416 - Flush Wood Doors: Glazed lites in doors.

D. Section 08 4435 - Protective Framed Glazing Assemblies: Glazing fire-tested as part of the wall assembly. Refer to this section for fire rated glass.

E. Section 08 4229 - Automatic Entrances: Glazing performs as part of door assembly.

F. Section 08 4413 - Glazed Aluminum Curtain Walls: Glazing performs as part of wall assembly.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015.

C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2015).

E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

G. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

H. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2015.

I. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

J. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.

K. GANA (SM) - GANA Sealant Manual; 2008.

L. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (2016).

M. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2017.

N. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2014, with Errata (2017).

O. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2017.

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 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data on Insulating Glass Unit and Glazing Unit 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 one sample 12 by 12 inch in size Insulating glass units.

E. Certificate: Certify that products of this section meet or exceed specified requirements.

F. 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. Perform Work in accordance with IGMA TM-3000 for glazing installation methods. Maintain one copy on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.07 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.08 WARRANTY

A. See Section 01 7800 - 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. Glass Fabricators:
   1. GGI - General Glass International: www.generalglass.com/#sle.
   2. JE Berkowitz, LP: www.jeberkowitz.com/#sle.
   3. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com/#sle.
   4. Viracon, Inc: www.viracon.com/#sle.
   5. Substitutions: Refer to Section 01 6000 - Product Requirements & SUBSTITUTIONS.

B. Float Glass Manufacturers:
   1. AGC Glass North America, Inc; _____: www.agcglass.com/#sle.
   2. Cardinal Glass Industries; _____: www.cardinalcorp.com/#sle.
   3. Guardian Glass, LLC; _____: www.guardianglass.com/#sle.
   4. Pilkington North America Inc; _____: www.pilkington.com/na/#sle.
   5. Vitro Architectural Glass (formerly PPG Glass); _____: www.vitroglazings.com/#sle.
   6. Substitutions: Refer to Section 01 6000 - Product Requirements & SUBSTITUTIONS.

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. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
2. 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.
3. Glass thicknesses listed are minimum.

B. Weather Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure weather barrier.
1. In conjunction with weather barrier and joint sealer materials described in other sections.
a. Refer to Section 07 2500.

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-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
1. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
2. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.

2.04 INSULATING GLASS UNITS

A. Manufacturers:
1. Any of the manufacturers specified for float glass.
2. AGC Glass North America, Inc; _____: www.agcglass.com/#sle.
3. Cardinal Glass Industries; _____: www.cardinalcorp.com/#sle.
4. Guardian Glass, LLC; _____: www.guardianglass.com/#sle.
5. Pilkington North America Inc; _____: www.pilkington.com/na/#sle.
6. Viracon, Apogee Enterprises, Inc; _____: www.viracon.com/#sle.
7. Vitro Architectural Glass (formerly PPG Glass); _____: www.vitroglazings.com/#sle.
8. Substitutions: Refer to Section 01 6000 - Product Requirements & SUBSTITUTIONS.

B. 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. Spacer Color: Aluminum.
4. Edge Seal:
5. Color: Grey.
6. Purge interpane space with dry air, hermetically sealed.

2.05 BASIS OF DESIGN - INSULATING GLASS UNITS

A. Type IG -1 Basis of Design - Vitro Optigray exterior panel Solarban 90XL surface 2 with Clear interior panel
1. Applications: Exterior insulating glass glazing unless otherwise indicated.
2. Space between lites filled with air.
3. Total Thickness: 1 inch.
4. Thermal Transmittance (U-Value): 0.24
5. Visible Light Transmittance (VLT): 36 percent, nominal.
6. Solar Heat Gain Coefficient (SHGC): 0.20, nominal.
7. Light to Solar Gain : 1.80

8. Glazing Method: Dry glazing method, gasket glazing.
9. Basis of Design - Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
10. Outboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
    a. Low-E Coating: Vitro Architectural Glass (formerly PPG Glass) Solarban 70XL on #2 surface.
    b. Glass: Clear.
11. Inboard Lite: Fully tempered float glass, 1/4 inch thick.
    a. Coating: No coating on inboard lite.
    b. Glass: Optigray.
12. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of another acceptable manufacturer.
13. Substitution Procedures: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.
    a. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.06 GLAZING UNITS

A. Type G-1 - Monolithic Exterior Vision Glazing:
   1. Applications: entrance doors & automatic doors.
   2. Glass Type: Fully tempered float glass.
   3. Tint: Vitro Optigray.
   4. Thickness: 1/4 inch, nominal.

B. Type G-2 - Monolithic Interior Vision Glazing:
   1. Applications: sidelights, transoms & door lites in wood doors.
   2. Glass Type: Fully tempered float glass.
   3. Tint: Clear.
   4. Thickness: 1/4 inch, nominal.

C. Type G-3 - Monolithic Safety Glazing: Non-fire-rated.
   1. Applications:
      a. Glazed panels in partitions seperating secure entry from lobby
   2. Glass Type: Fully tempered safety glass as specified.
   3. Tint: Clear.
   4. Thickness: 1/2 inch, nominal.

2.07 GLAZING COMPOUNDS

A. Type GC-5 - Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

B. Manufacturers:
   1. BASF Corporation; _____: www.basf.com/us/en.html/#sle.
   2. Bostik Inc; _____: www.bostik-us.com/#sle.
   3. Dow Corning Corporation; _____: www.dowcorning.com/construction/#sle.
   4. Momentive Performance Materials, Inc; _____: www.momentive.com/#sle.
   5. Pecora Corporation; _____: www.pecora.com/#sle.
   6. Tremco Commercial Sealants & Waterproofing; Proglaze SSG: www.tremcosealants.com/#sle.
   7. Substitutions: Refer to Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.08 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 of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch 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 long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

C. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

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. 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. 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, masonry cleaners, etc.

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 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 INSTALLATION - WET GLAZING METHOD (SEALANT AND SEALANT)

A. Application - Interior, Partition seperating security que from lobby

B. Place setting blocks at 1/4 points and install glazing pane or unit.

C. Install removable stops with glazing centered in space by inserting spacer shims both sides at 24 inch intervals, 1/4 inch below sight line.

D. Fill gaps between glazing and stops with _____ type sealant to depth of bite on glazing, but not more than 3/8 inch below sight line to ensure full contact with glazing and continue the air and vapor seal.

E. Apply sealant to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.06 INSTALLATION - BUTT JOINT GLAZING METHOD (SEALANT ONLY)

A. Application - Interior, Partition seperating security que from lobby

B. Temporarily brace glass in position for duration of glazing process; mask edges of glass at adjoining glass edges and between glass edges and framing members.

C. Temporarily secure a small diameter non-adhering foamed rod on back side of joint.

D. Apply sealant to open side of joint in continuous operation; thoroughly fill joint without displacing foam rod, and then tool sealant surface smooth to concave profile.

E. Permit sealant to cure then remove foam backer rod, and then apply sealant to opposite side, tool smooth to concave profile.

F. Remove masking tape.

3.07 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

C. Monitor and report installation procedures and unacceptable conditions.

3.08 CLEANING

A. See Section 01 7419 - 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 non-permanent labels immediately after glazing installation is complete.

D. Clean glass and adjacent surfaces after sealants are fully cured.

E. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.09 PROTECTION

A. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

3.10 SCHEDULES

A. Glazed Aluminum Curtain Wall and Storefront Window Frame Glazing: Glass Type IG 1, install glass using dry method, and with glass thickness required to comply with performance requirements indicated in Section 08 4413.

B. Aluminum Exterior Entrance Door and Sidelight Glazing: Glass Type G-1. _____

C. Hollow Metal Steel Frames, Interior Glazing: Glass Type G-2 _____

D. Flush Wood Door Glazing:
   1. Interior: Glass Type G-2, 1/4 inch thick _____

END OF SECTION

SECTION 08 9100
LOUVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Louvers, frames, and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 2500 - Weather Barriers: Sealing frames to weather barrier installed on adjacent construction.

B. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

1.03 REFERENCE STANDARDS

A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2015.

B. AMCA 511 - Certified Ratings Program for Air Control Devices; 2010.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.

C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, tolerances; head, jamb and sill details; blade configuration, screens, blankout areas required, and frames.

D. Test Reports: Independent agency reports showing compliance with specified performance criteria.

1.05 QUALITY ASSURANCE

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer's warranty against distortion, metal degradation, and connection failures of louver components.
   1. Finish: Include twenty year coverage against degradation of exterior finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Louvers:
   1. Airolite Company, LLC: www.airolite.com/#sle.
   2. American Warming and Ventilating: www.awv.com.
   3. Construction Specialties, Inc: www.c-sgroup.com/#sle.
   4. Ruskin Company: www.ruskin.com/#sle.
   5. _____.
   6. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.02 LOUVERS

A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.
   1. Wind Load Resistance: Design to resist positive and negative wind load of 40 psf without damage or permanent deformation.
   2. Intake Louvers: Design to allow maximum of 0.01 oz/sq ft water penetration at calculated intake design velocity based on design air flow and actual free area, when tested in accordance with AMCA 500-L.
   3. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.
   4. Screens: Provide bird screens mounted on the interior face of all louvers.

B. Stationary Louvers: Horizontal blade, extruded aluminum construction, ____.
   1. Free Area: 44 %, minimum.
   2. Blades: drainable blade
   3. Frame: 5 inches deep, channel profile; corner joints , with continuous recessed caulking channel each side.
   4. Aluminum Thickness: Frame 12 gage, 0.0808 inch minimum; blades 12 gage, 0.0808 inch minimum.
   5. Aluminum Finish: High performance organic coatings; finish welded units after fabrication.

2.03 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Bird Screen: Interwoven wire mesh of aluminum, 0.063 inch diameter wire, 1/2 inch open weave, diagonal design.

C. Insect Screen: 18 x 16 size aluminum mesh.

2.04 ACCESSORIES

A. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.

B. Insect Screen: 18 x 16 size aluminum mesh.

C. Fasteners and Anchors: Stainless steel.

D. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared openings and flashings are ready to receive this work and opening dimensions are as indicated on shop drawings.

3.02 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Coordinate with installation of flashings by others.

C. Install louvers level and plumb.

D. Align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

E. Install flashing and interface with weather barrier using same technique as window and door openings.

F. Secure louver frames in openings with concealed fasteners.

G. Coordinate with installation of mechanical duct work .

3.03 CLEANING

A. Strip protective finish coverings.

B. Clean surfaces and components.

3.04 SCHEDULES

A. West Wall: Intake louver 48"w X 30" h

END OF SECTION

SECTION 09 0561
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section applies to floors identified in contract documents that are receiving the following types of floor coverings:
   1. Resilient tile and sheet.
   2. Carpet tile.
   3. Thin-set ceramic tile and stone tile.

B. Preparation of new concrete floor slabs for installation of floor coverings.

C. Testing of concrete floor slabs for moisture and alkalinity (pH).

D. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
   1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is advised by testing agency's report.

E. Patching compound.

F. Remedial floor coatings.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Limitations on curing requirements for new concrete floor slabs.

1.03 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2016a.

B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete; 1999 (Reapproved 2014).

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2017.

D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2016a.

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. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and alkalinity (pH) limits and test methods.
   2. Manufacturer's required bond/compatibility test procedure.

B. Testing Agency's Report:
   1. Description of areas tested; include floor plans and photographs if helpful.
   2. Summary of conditions encountered.
   3. Moisture and alkalinity (pH) test reports.
   4. Copies of specified test methods.
   5. Recommendations for remediation of unsatisfactory surfaces.
   6. Product data for recommended remedial coating.
   7. Submit report to Architect.
   8. Submit report not more than two business days after conclusion of testing.

C. Adhesive Bond and Compatibility Test Report.

1.06 QUALITY ASSURANCE

A. Moisture and alkalinity (pH) testing shall 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.

D. Remedial Coating Installer Qualifications: Company specializing in performing work of the type specified in this section, trained by or employed by coating manufacturer, and able to provide at least 3 project references showing at least 3 years' experience installing moisture emission coatings.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with manufacturer’s instructions and recommendations.

B. Deliver materials in manufacturer’s packaging; include installation instructions.

C. Keep materials from freezing.

1.08 FIELD CONDITIONS

A. Maintain ambient temperature and relative humidity at levels recommended by testing proceedure.

PART 2 PRODUCTS

2.01 MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
   1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
   2. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.

B. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.

C. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.
   1. Thickness: As required for application and in accordance with manufacturer's installation instructions.
   2. Use product recommended by testing agency.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:
   1. Preliminary cleaning.
   2. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
   3. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   4. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   5. Specified remediation, if required.
   6. Patching, smoothing, and leveling, as required.
   7. Other preparation specified.
   8. Adhesive bond and compatibility test.
   9. Protection.

B. Remediations:
   1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
   2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating or remedial sheet membrane over entire suspect floor area.
   3. Excessive Alkalinity (pH): If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.02 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F1869 and as follows.

D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.

F. Report: Report the information required by the test method.

3.03 ALKALINITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.

C. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.

D. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.04 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.05 APPLICATION OF REMEDIAL FLOOR COATING

A. Comply with requirements and recommendations of coating manufacturer.

END OF SECTION

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.
B. Interior metal stud partition framing.
C. Metal channel ceiling framing.
D. Acoustic insulation.
E. Gypsum sheathing.
F. Cementitious backing board.
G. Gypsum wallboard.
H. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

A. Section 05 4000 - Cold-Formed Metal Framing: Metal stud framing of exterior walls.
B. Section 07 2100 - Thermal Insulation: Acoustic insulation.
C. Section 07 2500 - Weather Barriers: Water-resistive barrier over sheathing.
D. Section 07 8400 - Firestopping: Top-of-wall assemblies at fire rated walls.
E. Section 07 9200 - Joint Sealants: Sealing acoustical gaps in construction.
F. Section 07 9005 - Joint Sealers: Acoustic sealant.

1.03 REFERENCE STANDARDS

A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2012.
B. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2010 (Reaffirmed 2016).
C. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (Reaffirmed 2016).
D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
E. ANSI A108/A118/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2017.
F. ANSI A108/A118/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2017.
G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.
H. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.
I. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.
J. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2014, with Editorial Revision (2015).
K. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.
L. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2017.
M. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2017a.

N. 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; 2015.

O. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.

P. ASTM C1278/C1278M - Standard Specification for Fiber-Reinforced Gypsum Panel; 2017.

Q. ASTM C1325 - Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units; 2017a.

R. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

S. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.

T. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

U. ASTM E413 - Classification for Rating Sound Insulation; 2016.

V. GA-216 - Application and Finishing of Gypsum Panel Products; 2016.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum 5 years of documented experience.

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: Provide completed assemblies with the following characteristics:
   1. Acoustic Attenuation: STC of 50-54 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
   2. Fire Rated Assemblies: Provide completed assemblies with the following characteristics:
      a. Fire Rated Partitions: refer to project drawings; 1 hour rating.
      b. Head of Fire Rated Partitions: refer to project drawings; 1 hour rating.

2.02 METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories:
   1. ClarkDietrich Building Systems; ____: www.clarkdietrich.com/#sle.
   2. Marino; ____: www.marinoware.com/#sle.
   3. Phillips Manufacturing Company; _____: www.phillipsmfg.com.
   4. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

B. Non-Loadbearing Framing System Components: ASTM C645; 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.
   1. Studs: "C" shaped with flat or formed webs with knurled faces.
   2. Runners: U shaped, sized to match studs.
   3. Ceiling Channels: C-shaped.
   4. Furring: Hat-shaped sections, minimum depth of 7/8 inch maximum depth of 1-1/2 inch.
   5. Blocking: 20 gauge steel sheet.

C. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

D. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
   1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
   2. Material: ASTM A653/A653M steel sheet, SS Grade 50/340, with G60/Z180 hot dipped galvanized coating.
   3. Provide components UL-listed for use in UL-listed fire-rated head of partition joint systems indicated on drawings.
   4. Deflection and Firestop Track:
      a. Provide mechanical anchorage devices as described above that accommodate deflection while maintaining the fire-rating of the wall assembly.

E. Non-Loadbearing Framing Accessories:
   1. Partial Height Wall Framing Support: Provides stud reinforcement and anchored connection to floor.
      a. Materials: ASTM A36/A36M formed sheet steel support member with factory-welded ASTM A1003/A1003M steel plate base.
      b. Height: 23-3/4 inches, and 35-3/4 inches. based on wall height
      c. Products:
         1) ClarkDietrich; Pony Wall (PW): www.clarkdietrich.com/#sle.
         2) The Steel Network: Mid Wall _____.

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.gpgypsum.com/#sle.
   4. Lafarge North America Inc: www.lafargenorthamerica.com.
   5. National Gypsum Company; ____: www.nationalgypsum.com/#sle.
   6. USG Corporation; ____: www.usg.com/#sle.

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.
      a. Mold resistant board is required at all locations.
   3. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
   4. Thickness:
      a. Vertical Surfaces: 5/8 inch.
      b. Ceilings: 5/8 inch.
      c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
   5. Mold Resistant Paper Faced Products:
      a. American Gypsum Company; M-Bloc.
      b. CertainTeed Corporation; ProRoc Brand Moisture & Mold Resistant Gypsum Board.
      c. Lafarge North America Inc; Mold Defense Drywall.
      d. National Gypsum Company; Gold Bond Brand XP Gypsum Board.
      e. USG Corporation; Sheetrock Brand Mold Tough Gypsum Panels.
      f. USG Corporation; Sheetrock Brand Mold Tough Gypsum Panels AR.
      g. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

C. Impact Resistant Wallboard:
   1. Application: All restrooms, custodial closets .
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

3. Paper-Faced Type: Gypsum wallboard as defined in ASTM C1396/C1396M.
4. Unfaced Type: Interior fiber-reinforced gypsum panels as defined in ASTM C1278/C1278M.
5. Type: Fire resistance rated Type X, UL or WH listed.
6. Thickness: 5/8 inch.
7. Edges: Tapered.
8. Products:
    a. National Gypsum Company; Gold Bond Hi-Impact Brand XP Wallboard.
    b. Temple-Inland Building Product by Georgia-Pacific, LLC; ComfortGuard IR Impact Resistant.
    c. USG Corporation; Fiberock Brand Panels--VHI Abuse-Resistant.
    d. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

D. Backing Board For Wet Areas:
1. Application: Surfaces behind tile in wet areas including walls within 5 feet of urinals and waterclosets.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
    a. Thickness: 5/8 inch.
    b. Products:
        1) Custom Building Products; _____: www.custombuildingproducts.com/#sle.
        2) National Gypsum Company; PermaBase Brand Cement Board.
        3) USG Corporation; _____: www.usg.com/#sle.
        4) Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

E. Backing Board For Non-Wet Areas: Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.
1. Application: Vertical surfaces behind thinset tile, except in wet areas.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. Type: Regular and Type X, in locations indicated.
4. Type X Thickness: 5/8 inch.
5. Regular Board Thickness: 5/8 inch.
6. Edges: Tapered.
7. Products:
    a. American Gypsum Company; M-Bloc.
    b. CertainTeed Corporation; ProRoc Brand Moisture & Mold Resistant Gypsum Board.
    c. Georgia-Pacific Gypsum; DensShield Tile Backer.
    d. Lafarge North America Inc; Mold Defense Drywall.
    e. National Gypsum Company; Gold Bond Brand XP Gypsum Board.
    f. USG Corporation; Sheetrock Brand Mold Tough Gypsum Panels.

F. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Ceilings, unless otherwise indicated.
2. Thickness: 5/8 inch.
3. Edges: Tapered.

2.04 GYPSUM WALLBOARD ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 3 inch.

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
1. Products:

a. Franklin International, Inc; Titebond GREENchoice Professional Acoustical Smoke and Sound Sealant: www.titebond.com/#sle.
b. Liquid Nails, a brand of PPG Architectural Coatings; AS-825 Acoustical Sound Sealant: www.liquidnails.com/#sle.
c. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

C. Finishing Accessories: ASTM C1047, galvanized steel at interior applications. Rolled zinc at exterior applications.
1. Types: As detailed or required for finished appearance.
2. Special Shapes: In addition to conventional corner bead and control joints, provide L-bead at edges abutting masonry walls and steel framing.

D. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic or rolled zinc, unless noted otherwise.
1. Corner Beads: Low profile, for 90 degree outside corners.
a. Products:
1) CertainTeed Corporation; No-Coat Drywall Corner: www.certainteed.com/#sle.
2) ClarkDietrich; Strait-Flex Big-Stick: www.clarkdietrich.com/#sle.
3) Phillips Manufacturing Co; Everlast Corner Bead: www.phillipsmfg.com/#sle.
4) Trim-Tex, Inc; _____: www.trim-tex.com/#sle.
5) Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.
2. L-Trim with Tear-Away Strip: Sized to fit 5/8 inch thick gypsum wallboard.
a. Products:
1) Phillips Manufacturing Co; gripSTIK L-Tear: www.phillipsmfg.com/#sle.
3. Expansion Joints:
a. Type: V-shaped PVC with tear away fins.
b. Type: V-shaped metal with factory-installed protective tape.
c. Type: Accordian profile with factory-installed protective tape.
d. Type: Off-angle inside corner expansion.
e. Products:
1) Phillips Manufacturing Co; 093 Expansion Control Joint: www.phillipsmfg.com/#sle.
2) Trim-Tex, Inc; _____: www.trim-tex.com/#sle.
3) Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

E. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.

F. High Build Drywall Surfacer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.

G. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch 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 : 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.
1. Extend partition framing to bottom of slab above as indicated in project drawings other partitions may terminate 6" above ceiling.

2. Partitions Terminating 6" above ceiling: Attach ceiling runner securely to structure using kickers allowing wall to terminate 6 inches min above ceiling finish.
3. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.

D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

E. Standard Wall Furring: Install at masonry walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 12 inches on center.
1. Orientation: Vertical.
2. Spacing: At 16 inches on center.

F. Blocking: Install mechanically fastened steel sheet blocking for support of:
1. Wall mounted cabinets.
2. Plumbing fixtures.
3. Toilet partitions.
4. Toilet accessories.
5. Wall mounted door hardware.

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 Non-Rated: 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. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

D. Provide deflection and control joint accommodation, do not bridge over these joints with sheathing panels.

E. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

F. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of non-rated 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.
1. Not more than 30 feet apart on walls and ceilings over 50 feet 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. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
1. Level 5: Walls and ceilings to receive paint finish.
2. Level 3: Mechanical rooms & custodial rooms
3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
4. Level 1: Wall areas above finished ceilings, whether or not accessible in the completed construction.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.

C. 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.

D. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.07 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09 3000
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Large Porcelain wall tile

D. Stone thresholds.

E. Ceramic trim.

F. Non-ceramic trim.

1.02 RELATED REQUIREMENTS

A. Section 07 1300 - Sheet Waterproofing. Shower pan membrane.

B. Section 07 9005 - Joint Sealers.

C. Section 09 2116 - Gypsum Board Assemblies: Installation of tile backer board.

1.03 REFERENCE STANDARDS

A. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes For Thin-Set Ceramic Tile And Dimension Stone Installation; 2014.

B. 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; 2017.

C. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2017.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

D. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum 10 years of documented experience.

B. Installer Qualifications: Company specializing in performing tile installation, with minimum of five years of documented experience.

1.07 MOCK-UP

A. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.

B. Construct tile mock-up, in location acceptable to architect and contractor, incorporating all components specified for the location.
   1. Minimum size of mock-up is 48"L X wall height.
   2. Approved mock-up may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.09 FIELD CONDITIONS

A. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.

PART 2 PRODUCTS

2.01 TILE

A. Manufacturers: All products by the same manufacturer.
   1. American Olean Corporation: www.americanolean.com/#sle.
   2. Dal-Tile Corporation: www.daltile.com/#sle.
   3. Emser Tile, LLC: www.emser.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Ceramic Mosaic Tile, Type Existing Repair : ANSI A137.1, standard grade.
   1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
   2. Size: 2 by 2 inch, nominal.
   3. Shape: Square.
   4. Edges: Cushioned.
   5. Surface Finish: Slip resistant.
   6. Color(s): To match existing and be approved by Architect from manufacturer's standard range.
   7. Pattern: match existing .
   8. Trim Units: Matching bead, cove, and surface bullnose shapes in sizes coordinated with field tile.

C. Glazed Wall Tile: ANSI A137.1, standard grade.
   1. Moisture Absorption: 7.0 to 20.0 percent as tested in accordance with ASTM C373.
   2. Size: 6 by 6 inch, nominal.
   3. Edges: Cushioned.
   4. Surface Finish: Matte glaze.
   5. Color(s): To be selected by Architect from manufacturer's standard range.
   6. Trim Units: Matching bead, bullnose, cove, and base shapes in sizes coordinated with field tile.

D. Porcelain Tile, Type LG: interior wall veneer .
   1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
   2. Size: _53" by_34" inch refer to drawing interior details for all panel sizes and joint pattern
   3. Thickness: 1/4 inch.
   4. Edges: fabricate radius on large panel edge as detailed. .
   5. Surface Finish: Unglazed.
   6. Color(s): To be selected by Architect from manufacturer's full range.
   7. Products:
      a. Dal Tile Panoramic porcellain surfaces.
      b. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

E. Porcelain Tile Type PT1: ANSI A137.1, and as follows:
   1. DIgnitary manufactured by Dal Tile .
   2. Moisture Absorption: 0 to 0.5 percent.
   3. Size and Shape: 24 X 24 X 3/8".
   4. Surface Finish: Unpolished.
   5. Colors: To be selected by Architect from manufacturer's full range, two colors will be selected, layout as shown on floor plans.
   6. Trim Units: Matching 3 x 24 surface bullnose base sizes coordinated with field tile

2.02 TRIM AND ACCESSORIES

A. Ceramic Trim: Matching surface bullnose ceramic shapes in sizes coordinated with field tile.
   1. Applications: Use in the following locations:
      a. Inside Corners: Jointed.
      b. Outside Corners: Non ceramic trim
      c. Floor to Wall Joints: spaced above floor surface with sealant joint between bottom edge of base and floor surface.
   2. Manufacturers: Same as for tile.

B. Non-Ceramic Trim: Brushed stainless steel, style and dimensions to suit application, for setting using tile mortar or adhesive.
   1. Applications:
      a. Open edges of wall tile: Schluter Rondec
      b. Wall corners, outside: Schluter Rondec
      c. Borders and other trim as indicated on drawings.
   2. Manufacturers:
      a. Schluter-Systems: www.schluter.com/#sle.
      b. Genesis APS International: www.genesis-aps.com/#sle.
      c. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

C. Thresholds: Marble, white or gray, honed finish; 2 inches wide by full width of wall or frame opening; 1/2 inch thick; beveled one long edge with radiused corners on top side; without holes, cracks, or open seams.
   1. Applications:
      a. At doorways where tile terminates.

2.03 SETTING MATERIALS

A. Provide setting materials made by the same manufacturer as grout.

B. Polymer Modified Thin Set Adhesive: ANSI A118.4.
   1. Applications: Use this type of bond coat where indicated and where no other type of bond coat is indicated.
   2. Products:
      a. ARDEX Engineered Cements; ARDEX N 23 MICROTEC: www.ardexamericas.com.
      b. LATICRETE International, Inc; LATICRETE 254 Platinum: www.laticrete.com/#sle.
      c. Merkrete, by Parex USA, Inc; Merkrete 735 Premium Flex: www.merkrete.com/sle.
      d. ProSpec, an Oldcastle brand; Permalastic System: www.prospec.com.
      e. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

C. Mortar Bed Materials: Pre-packaged mix of Portland cement, sand, latex additive, and water.
   1. Products:
      a. ARDEX Engineered Cements; A 38: www.ardexamericas.com/#sle.
      b. LATICRETE International, Inc; LATICRETE 3701 Fortified Mortar Bed: www.laticrete.com/#sle.
      c. Merkrete, by Parex USA, Inc; Merkrete Underlay C: www.merkrete.com/#sle.
      d. Proflex Products, Inc; MSI - Mud Set Installation: www.proflex.us/#sle.
      e. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.04 GROUTS

A. Manufacturers:
   1. ARDEX Engineered Cements; _____: www.ardexamericas.com/#sle.
   2. ProSpec, an Oldcastle brand; ProColor Sanded Tile Grout: www.prospec.com.
   3. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout: www.laticrete.com/#sle.
   4. Merkrete, by Parex USA, Inc; Merkrete Duracolor Non-Sanded Color Grout: www.merkrete.com/#sle.

B. High Performance Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.

1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
3. Color(s): As selected by Architect from manufacturer's full line.
4. Products:
   a. ARDEX Engineered Cements; ARDEX FG-C MICROTEC: www.ardexamericas.com.
   b. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout: www.laticrete.com/#sle.
   c. Merkrete, by Parex USA, Inc; Merkrete Pro Grout: www.merkrete.com/#sle.
   d. ProSpec, an Oldcastle brand; ProColor Sanded Tile Grout: www.prospec.com.
   e. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

C. Grout Sealer: Liquid-applied, moisture and stain protection for existing or new Portland cement grout.
   1. Composition: Water-based colorless silicone.

2.05 ACCESSORY MATERIALS

A. Waterproofing Membrane at Showers and Tiled Tubs: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
   1. Fluid or Trowel Applied Type:
      a. Thickness: 25 mils, minimum, dry film thickness.
      b. Products:
         1) LATICRETE International, Inc; LATICRETE HYDRO BAN: www.laticrete.com/#sle.
         2) Merkrete, by Parex USA, Inc; Merkrete Hydro Guard 2000: www.merkrete.com/#sle.
         3) Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile setting materials.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.

D. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.

E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.03 INSTALLATION - GENERAL

A. Install tile and thresholds and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.13, manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor, base, and wall joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar, excess grout, or too little grout.

E. Form internal corners of wall tile square and external corners of wall tile with bullnosed non ceramic trim.

F. Install non-ceramic trim in accordance with manufacturer's instructions.

G. Install thresholds where indicated.

H. Sound tile after setting. Replace hollow sounding units.

I. Keep control and expansion joints free of mortar, grout, and adhesive.

J. Keep control joints free of adhesive or grout. Apply sealant to joints.

K. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

L. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.

M. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

N. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over interior concrete substrates, install in accordance with The Tile Council of North America Handbook Method F113, dry-set or latex-Portland cement bond coat, with polymer modified grout, unless otherwise indicated.

3.05 INSTALLATION - FLOORS - MORTAR BED METHODS

A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F112, bonded, unless otherwise indicated.
   1. Where waterproofing membrane is indicated, with standard grout or no mention of grout type, install in accordance with TCNA (HB) Method F121.

B. Mortar Bed Thickness: Varies to provide floor slopes to floor dains and thresholds, refer to enlarged restroom plans .

3.06 INSTALLATION - SHOWERS AND BATHTUB WALLS

A. At tiled shower receptors install in accordance with TCNA (HB) Method B415, mortar bed floor, and W244, thin-set over cementitious backer unit walls.

B. Grout with standard grout as specified above.

C. Seal joints between tile work and other work with sealant specified in Section 9005.

3.07 INSTALLATION - WALL TILE

A. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244_____.

B. Over coated glass mat backer board on studs, install in accordance with TCNA (HB) Method W245.

3.08 CLEANING

A. Clean tile and grout surfaces.

3.09 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Supplementary acoustical insulation above ceiling.

1.02 RELATED REQUIREMENTS

A. Section 07 2100 - Thermal Insulation: Acoustical insulation.

B. Section 07 9005 - Joint Sealers: Acoustical sealant.

1.03 REFERENCE STANDARDS

A. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2017.

B. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2014.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior humidity is controlled by the building systems.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on suspension system components.

C. Samples: Submit two samples 6x6 inch in size illustrating material , edge reveals, kerf and finish of acoustical units.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Acoustical Units: Quantity equal to 5 percent of total installed of each type of accoustical tile.

1.06 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 55 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Armstrong World Industries, Inc; ____: www.armstrong.com/#sle.
   2. CertainTeed Corporation; ____: www.certainteed.com/#sle.
   3. USG; ____: www.usg.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

B. Suspension Systems:
   1. Same as for acoustical units.

2.02 ACOUSTICAL UNITS

A. Acoustical Panels: Painted mineral fiber, ASTM E1264 Type III, with the following characteristics:
   1. VOC Content: Certified as Low Emission by one of the following :
      a. GreenGuard Children and Schools; www.greenguard.org.
      b. Product listing in the CHPS Low-Emitting Materials Product List at; www.chps.net/manual/lem_table.htm.
   2. Size: 24 by 24 inches.
   3. Thickness: 3/4 inches.
   4. NRC Range: 0.75 Minimum, determined as specified in ASTM E1264.
   5. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
   6. Edge: Reveal edge.
   7. Surface Color: White.
   8. Surface Pattern: fine texture.
   9. Suspension System: Exposed grid.
   10. Products: Basis of design
      a. Armstrong Ultima Tegular 1911.

2.03 SUSPENSION SYSTEM(S)

A. Manufacturers:
   1. Armstrong World Industries, Inc; Product Prelude ML: www.armstrong.com.
   2. CertainTeed Corporation: www.certainteed.com.
   3. Chicago Metallic Corporation: www.chicagometallic.com.
   4. USG: www.usg.com.
   5. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

B. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.

C. Exposed Steel Suspension System: Formed steel, commercial quality cold rolled; intermediate-duty.
   1. Profile: Tee; 9/16 inch wide face.
   2. Construction: Double web.
   3. Finish: Steel painted all areas.

2.04 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.

B. Perimeter Moldings: Same material and finish as grid.
   1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.

C. 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 INSTALLATION - SUSPENSION SYSTEM

A. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

B. Locate system on room axis according to reflected plan.

C. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

D. 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. 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.

F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

G. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

H. Do not eccentrically load system or induce rotation of runners.

I. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.
   2. Overlap and rivet corners.

3.03 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install units after above-ceiling work is complete.

E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

F. Cutting Acoustical Units:
   1. Make field cut edges of same profile as factory edges.
   2. Paint exposed core to match face color using manufacturer's touch up paint.
   3. Double cut and field paint exposed reveal edges.

3.04 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 09 6500
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient sheet flooring.

B. Resilient tile flooring.

C. Resilient base.

D. Resilient stair accessories.

E. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.

B. Section 09 0561 - Common Work Results for Flooring Preparation: Independent agency testing of concrete slabs, removal of existing floor coverings, cleaning, and preparation.

1.03 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2017.

B. ASTM F1303 - Standard Specification for Sheet Vinyl Floor Covering with Backing; 2004 (Reapproved 2014).

C. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile; 2013a.

D. ASTM F1861 - Standard Specification for Resilient Wall Base; 2016.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

D. Verification Samples: If requested, Submit two samples, 12 by 12 inch in size illustrating color and pattern for each resilient flooring product following color selection.

E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Flooring Material: 100 square feet of each type and color.
   2. Extra Wall Base: 100 linear feet of each type and color.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

D. Protect roll materials from damage by storing on end.

E. Do not double stack pallets.

1.07 FIELD CONDITIONS

A. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 SHEET FLOORING

A. Vinyl Sheet Flooring: Transparent or translucent vinyl wear layer over interlayer and backing.
   1. Minimum Requirements: Comply with ASTM F1303, Type I, with Class A fibrous or Class B plastic backing.
   2. Wear Layer Thickness: 0.020 inch minimum.
   3. Total Thickness: 0.080 inch minimum.
   4. Color: To be selected by Architect from manufacturer's full range.
   5. Manufacturers:
      a. Armstrong Flooring; DecorArt Rejuvenations: www.armstrongflooring.com.
      b. Johnsonite, a Tarkett Company; Acczent: www.johnosonite.com.
      c. Mannington Commercial; Entwined Resilient Sheet: www.manningtoncommercial.com.
      d. Shannon Specialty Floors, Inc; TEKNOFLOR: www.shannonspecialtyfloors.com/#sle.
      e. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.02 TILE FLOORING

A. Vinyl Composition Tile - VCT: Homogeneous, with color extending throughout thickness.
   1. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.
   2. Size: 12 by 12 inch.
   3. Thickness: 0.125 inch.
   4. Color: To be selected by Architect from manufacturer's full range.
   5. Manufacturers:
      a. Armstrong World Industries, Inc: www.armstrong.com.
      b. Mannington Mills, Inc: www.mannington.com.
      c. Johnsonite, a Tarkett Company; Product ____: www.johnsonite.com.

B. Vinyl Tile - Type LVT: Printed film type, with transparent or translucent wear layer.
   1. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
   2. Wear Layer Thickness: 0.020 inch.
   3. Total Thickness: 0.125 inch.
   4. Pattern: As indicated on drawings .
   5. Color: To be selected by Architect from manufacturer's full range.
   6. Manufacturers:
      a. Armstrong Flooring; Natural Creations with Diamond 10 Technology Mystix: www.armstrongflooring.com.
      b. Metroflor Corporation; Aspecta Five LVT: www.aspectaflooring.com.
      c. Mannington Commercial; Amtico LVT: www.manningtoncommercial.com.
      d. Shannon Specialty Floors, Inc; Tuf Stuf T3 Luxury Vinyl Tile: www.shannonspecialtyfloors.com/#sle.
      e. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.03 STAIR COVERING

A. One piece Treads & Risers. Sheet flooring on landings to match. Rubber; full width, depth and height of stair tread and riser in one piece; tapered thickness; nosing not less than 1-5/8 inch deep.

1. Nominal Thickness: 0.1875 inch.
2. Nosing: Square.
3. Style: Speckled, Micro Tone.
4. Color: As selected by architect from manufacturer's full range.
5. Manufacturers: Basis of Design, Johnsonite
   a. Burke Flooring: www.burkemercer.com.
   b. Johnsonite, a Tarkett Company; Product VIHTR: www.johnsonite.com.
   c. Roppe Corp: www.roppe.com.
   d. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.04 RESILIENT BASE

A. All base shall be from one manufacturer.

B. Resilient Base: ASTM F1861, Type TP, rubber, thermoplastic; top set Style B, Cove, and as follows:
   1. Height: 4 inch.
   2. Thickness: 0.125 inch.
   3. Finish: Satin.
   4. Length: 4 foot sections.
   5. Color: As selected from manufacturer's full range of colors.
   6. Accessories: Premolded external corners and internal corners.
   7. Manufacturers:
      a. Burke Flooring: www.burkemercer.com.
      b. Johnsonite, a Tarkett Company: www.johnsonite.com.
      c. Roppe Corp: www.roppe.com.
      d. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.05 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

C. Moldings, Transition and Edge Strips: Same material as flooring.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.
   1. Test in accordance with ASTM F710.
   2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.

C. Prohibit traffic until filler is fully cured.

D. Clean substrate.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Fit joints and butt seams tightly.

E. Set flooring in place, press with heavy roller to attain full adhesion.

F. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

G. Install edge strips specified in this section or 09 3000 at unprotected or exposed edges, where flooring terminates, and where indicated.
   1. Resilient Strips: Attach to substrate using adhesive.

H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

I. Install flooring in recessed floor access covers, maintaining floor pattern.

J. Install feature strips where indicated.

3.04 INSTALLATION - SHEET FLOORING

A. Lay flooring with joints and seams in accordance with seaming plan. Lay out seams to avoid widths less than 1/3 of roll width; match patterns at seams.

B. Cut sheet at seams in accordance with manufacturer's instructions.

C. Lay flooring with tightly butted seams, without any seam sealer .

3.05 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Lay flooring with joints and seams as shown in interior finish plan to building lines to produce symmetrical pattern.

C. Install square tile to basket weave pattern. Allow minimum 1/2 full size tile width at room or area perimeter.

3.06 INSTALLATION - RESILIENT BASE

A. Cove Base
   1. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
   2. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.
   3. Install base on solid backing. Bond tightly to wall and floor surfaces.
   4. Scribe and fit to door frames and other interruptions.

3.07 INSTALLATION - STAIR COVERINGS

A. Install stair coverings in one piece for full width and depth of tread & riser.

B. Adhere over entire surface. Fit accurately and securely.

3.08 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.09 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 09 6623
RESINOUS MATRIX TERRAZZO FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Epoxy matrix terrazzo with ground and polished finish to match existng in repair areas.

B. Divider strips.

1.02 REFERENCE STANDARDS

A. NTMA (GRAD) - Aggregate Gradation Standards; Current Edition.

B. NTMA (EPOXY) - Epoxy Terrazzo Specifications; Current Edition.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for divider strips, control joint strips, expansion joints, and sealer; include printed copy of current NTMA recommendations for type of terrazzo specified.

C. Shop Drawings: Indicate divider strip and control and expansion joint layout, and details of adjacent components. For precast units, detail profile and anchorage requirements.

D. Samples: Terrazzo contractor shall provide color options that closely match the existing terrazzo floors. Following initial selection prepare two samples, 12 inch by 12 inch in size illustrating color, chip size and variation, chip gradation, matrix color, and typical divider strip.

E. Cleaning and Maintenance Data: Include procedures for stain removal, stripping, and sealing.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with NTMA recommendations as posted at their web site at www.ntma.com.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section.
   1. Minimum ten years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store resin materials in a dry, secure area.

B. Maintain minimum temperature of 55 degrees F.

C. Keep products away from fire or open flame.

1.06 FIELD CONDITIONS

A. Do not install terrazzo when temperature is below 50 degrees F or above 90 degrees F.

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, measured at floor surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Resinous Matrix Terrazzo Flooring:
   1. Key Resin Company; Key Epoxy Terrazzo System: www.keyresin.com/#sle.
   2. Sherwin-Williams Company: General Polymers Brand; ____: www.generalpolymers.com/#sle.
   3. Sika Corporation; Sikafloor Terrazzo: www.sikafloorusa.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.02 EPOXY MATRIX TERRAZZO APPLICATIONS

A. Floors:
   1. Thickness: 3/8 inch, nominal.

2. Color(s): Match existing.

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.

2.04 ACCESSORIES

A. Divider Strips: Thickness and material to match existing.

B. Divider and Control Joint Strip Height: To suit thickness of terrazzo topping, with allowance for grinding.

C. Sealer: Colorless, non-yellowing, penetrating liquid type to completely seal matrix surface; not detrimental to terrazzo component, as recommended by terrazzo system manufacturer.

D. Subfloor Filler: Type as recommended by terrazzo manufacturer and per Section 09 0561.

E. Primer: As recommended by terrazzo system manufacturer for installation on concrete substrates present in project.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive terrazzo.

B. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of materials to sub-floor surfaces.

C. See Section 09 0561: Verify that concrete sub-floor surfaces are ready for terrazzo installation by testing for moisture vapor emission, internal relative humidity, and alkalinity; obtain instructions if test results are not within limits recommended by terrazzo materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Clean substrate of foreign matter.

B. Apply primer in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Saw cut substrate to install divider and control joint strips.

B. Install control joint strips straight and flat to locations indicated.

C. Install divider strips according to pattern approved on shop drawings.

D. Place terrazzo mix over substrate to thickness indicated.

3.04 FINISHING

A. Finish terrazzo to NTMA requirements.

B. Produce terrazzo finish surface to match approved sample.

C. Grind terrazzo surfaces with power disc machine; sequence with coarse to fine grit abrasive, using a wet method or using a dry grinder with vacuum to control dust.

D. Apply grout to fill voids exposed from grinding.

E. Remove grout coat by grinding, using a fine grit abrasive.

3.05 TOLERANCES

A. Maximum Variation from Flat Surface: 1/4 inch in 10 feet.

B. Maximum Variation from Level (Except Surfaces Sloping to Drain): 1/8 inch.

3.06 CLEANING

A. Scrub and clean terrazzo surfaces with neutral pH cleaner in accordance with manufacturer's instructions. Let dry.

B. Immediately after terrazzo has dried, apply sealer in accordance with manufacturer's instructions.

C. Polish surfaces in accordance with manufacturer's instructions.

3.07 PROTECTION

A. Protect finished terrazzo from damage due to subsequent construction until Date of Substantial Completion.

END OF SECTION

SECTION 09 6813
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

B. Removal of existing carpet tile.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2017.

B. CRI (CIS) - Carpet Installation Standard; Carpet and Rug Institute; 2009.

C. CRI (GLA) - Green Label Testing Program - Approved Adhesive Products; Carpet and Rug Institute; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate layout of joints.

C. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

D. Samples: Following preliminary color selections, Submit two carpet tiles illustrating color and pattern design for each carpet color selected. Project will require two colors of carpet tile.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Carpet Tiles: Quantity equal to 2 percent of total installed of each color and pattern installed.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.06 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Milliken & Company: www.milliken.com. .

B. Tile Carpeting:
   1. Tandus: www.tandus.com.
   2. Interface, Inc; ____: www.interfaceinc.com/#sle.

2.02 MATERIALS

A. Tile Carpeting: Tufted, manufactured in one color dye lot.
   1. Product: Straight Talk 2.0 manufactured by Milliken.
   2. Tile Size: 18 by 18 inch, nominal.
   3. Backing: Underscore ES Cushion
   4. Color: To be selected from manufacturer's full range..
   5. Pattern: Connection, Eye Contact & Snap Back.

2.03 ACCESSORIES

A. Sub-Floor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Edge Strips: Rubber, color as selected by Architect.

C. Adhesives: Acceptable to carpet tile manufacturer, compatible with materials being adhered; maximum VOC of 50 g/L; CRI Green Label certified; in lieu of labeled product, independent test report showing compliance is acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.

C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for flooring installation by testing for moisture and pH.
   1. Test in accordance with ASTM F710.
   2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.

C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

D. Vacuum clean substrate.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in monolithic pattern, with pile direction parallel to next unit, set parallel to building lines.

F. Locate change of color or pattern between rooms under door centerline.

G. Fully adhere carpet tile to substrate.

H. Trim carpet tile neatly at walls and around interruptions.

I. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 9113
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. Exposed surfaces of steel lintels and ledge angles.
   2. Hollow metal doors and frames.
   3. Steel bollards & columns.

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, and operating parts of equipment.
   5. Stainless steel, anodized aluminum and bronze.
   6. Brick masonry.
   7. Glass.
   8. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 09 9123 - Interior Painting.

B. Section 09 9600 - High-Performance Coatings.

1.03 REFERENCE STANDARDS

A. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.

B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition, www.paintinfo.com.

C. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

D. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).

E. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.04 SUBMITTALS

A. See Section 01 3000 - 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(s) product is to be used in; include description of each system.

C. Manufacturer's Instructions: Indicate special surface preparation procedures.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements & SUBSTITUTIONS, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.

3. Label each container with color in addition to the manufacturer's label.

1.05 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 and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.06 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

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. Behr Process Corporation; _____: www.behr.com/#sle.
2. Benjamin Moore & Company: www.benjaminmoore.com.
3. PPG Paints; _____: www.ppgpaints.com/#sle.
4. Sherwin-Williams Company; _____: www.sherwin-williams.com/#sle.
5. Valspar Corporation: www.valsparpaint.com/#sle.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.
1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
4. Supply each paint material in quantity required to complete entire project's work from a single production run.
5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

C. Colors: As indicated in Color Schedule.
1. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
2. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.03 PAINT SYSTEMS - EXTERIOR

A. Paint E-OP - Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including primed metal.

1. Two top coats and one coat primer.
2. Top Coat(s): Exterior Light Industrial Coating, Water Based; MPI # 164.
3. Primer: As recommended by top coat manufacturer for specific substrate.

2.04 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.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

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 surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
   2. Prepare surface according to SSPC-SP 2 or SSPC-SP3.

E. 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. if required by paint manufacturer's instructions.
   3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

F. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

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.

D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

E. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

END OF SECTION

SECTION 09 9123
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, including the following:
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.

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

A. Section 09 9113 - Exterior Painting.

B. Section 09 9600 - High-Performance Coatings.

1.03 REFERENCE STANDARDS

A. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition, www.paintinfo.com.

B. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

C. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01 3000 - 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(s) product is to be used in; include description of each system.

C. Manufacturer's Instructions: Submit product technical data sheets, and indicate special surface preparation procedures and substrate conditions requiring special attention.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements & SUBSTITUTIONS, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
   3. Label each container with color, type, and texture in addition to the manufacturer's label.

1.05 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 and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.06 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. Provide lighting level of 80 ft candles 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. Behr Process Corporation: www.behr.com/#sle.
   2. Benjamin Moore & Company: www.benjaminmoore.com.
   3. PPG Paints: www.ppgpaints.com/#sle.
   4. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
   5. Valspar Corporation: www.valsparpaint.com/#sle.

C. Primer Sealers: Same manufacturer as top coats.

D. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

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. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   3. 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. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

C. Colors: As indicated on drawings.
   1. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
   2. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.03 PAINT SYSTEMS - INTERIOR

A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, uncoated steel, shop primed steel, and galvanized steel.
   1. Two top coats and one coat primer.
   2. Top Coat(s): Interior Latex, flat; MPI #52.
      a. Products:
   3. Primer: As recommended by top coat manufacturer for specific substrate.

B. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including Door frames and steel handrails :
   1. Medium duty applications include doors, door frames, guardrails, balustrades, and structural steel to above ceiling or 10 feet above finished floor.
   2. Two top coats and one coat primer.
   3. Top Coat(s): Interior Light Industrial Coating, Water Based; MPI #153.
   4. Primer: As recommended by top coat manufacturer for specific substrate.

C. Paint CI-OP-3A - Concrete/Masonry, Opaque, Alkyd, 3 Coat:
   1. One coat of block filler.
   2. Eg-shel: Two coats of alkyd enamel; MPI #51.

2.04 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 properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

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 surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Masonry:
   1. Masonry mortar must cure 28 days prior to painting.
   2. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
   3. Prepare surface as recommended by top coat manufacturer.

F. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

G. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.

H. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
   2. Prepare surface according to SSPC-SP 2.

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 using methods recommended in writing by paint manufacturer and SSPC-SP3. Protect from corrosion until coated.

J. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

E. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

F. Sand wood and metal surfaces lightly between coats to achieve required finish.

G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 SCHEDULE - PAINT SYSTEMS

END OF SECTION

SECTION 09 9600
HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. High performance coatings.

B. Surface preparation.

1.02 RELATED REQUIREMENTS

A. Section 09 9113 - Exterior Painting.

B. Section 09 9123 - Interior Painting.

1.03 REFERENCE STANDARDS

A. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.

B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition, www.paintinfo.com.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide complete list of all 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 coating system(s) product is to be used in; include description of each system.

C. Product Data: Provide data indicating coating materials.

D. Manufacturer's Installation Instructions: Submit product technical data sheets, and indicate special procedures and perimeter conditions requiring special attention.

E. Maintenance Data: Include cleaning procedures and repair and patching techniques.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Coating Materials: 1 gallon of each type and color.
   2. Label each container with manufacturer's name, product number, color number, and room names and numbers where used.

1.05 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 coating, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Coating Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.06 FIELD CONDITIONS

A. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide high performance coating products from the same manufacturer.

B. High-Performance Coatings:
   1. Benjamin Moore & Company; Corotech Coatings: www.corotechcoatings.com.

2. PPG Paints; _____: www.ppgpaints.com/#sle.
3. Sherwin-Williams Company: www.protective.sherwin-williams.com/industries/#sle.
4. Substitutions: See Instructions to Bidders, Article 13

2.02 HIGH-PERFORMANCE COATINGS

A. MPI Standards: Provide products that comply with MPI standards indicated and are listed in "MPI Approved Products List."

2.03 TOP COAT MATERIALS

A. Coatings - General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated; number of coats specified does not include primer or filler coat.
   1. Colors: Selected from manufacturer's standard colors.

B. Epoxy Coating:
   1. Top Coat(s): Light Industrial Coating, Interior, Water Based Epoxy; MPI #151.
   2. Primer: As recommended by coating manufacturer for specific substrate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Do not begin application of coatings until substrates have been properly prepared.

C. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.

D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

3.02 PREPARATION

A. Clean surfaces of loose foreign matter.

B. Remove substances that would bleed through finished coatings. If unremovable, seal surface with shellac.

C. Remove finish hardware, fixture covers, and accessories and store.

D. Galvanized Surfaces:
   1. Repair galvanized surface, welds, field produce holes, etc. with zinc rich primer.

E. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.

3.03 PRIMING

A. Apply primer to all surfaces to recieve high performance coating, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

3.04 COATING APPLICATION

A. Apply coatings in accordance with manufacturer's written instructions, to thicknesses specified and recommendations in "MPI Architectural Painting and Specification Manual".

B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

3.05 CLEANING

A. Clean surfaces immediately of overspray, splatter, and excess material.

B. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.06 PROTECTION

A. Protect finished work from damage.

END OF SECTION

SECTION 10 1400
SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Room and door signs.

B. Building Safety signs.

C. Emergency evacuation maps.

D. Plaque.

1.02 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.

1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
2. Submit for approval by Owner through Architect prior to fabrication.

D. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

F. Shop Drawings: Indicating fabricated letter constrcution and mounting method.

G. Plaque: Provide approval rubbing based on text and layout provided by architect.

1.04 QUALITY ASSURANCE

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

1.05 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Package room and door signs in sequential order of installation, labeled by floor or building.

C. Store tape adhesive at normal room temperature.

1.06 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Interior Signage :

1. Best Sign Systems, Inc; Product Lucent: www.bestsigns.com. Basis of design product
2. Inpro; _____: www.inprocorp.com.

3. Mohawk Sign Systems, Inc; ____: www.mohawksign.com/#sle.
4. Seton Identification Products; ____: www.seton.com/aec/#sle.
5. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

B. Building Plaque:
1. Cosco Industries; Cast Aluminum: www.coscoarchitecturalsigns.com/#sle.
2. Matthews International Corporation.
3. Southwell Company.
4. Metallic Arts Inc.
5. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.02 INTERIOR SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 _____, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Room Door Signs: Provide a sign for all interior door openings
1. Sign Type: Flat signs with engraved panel media.
2. Where noted in schedule, Provide changable printed media slot with clear cover allowing room assigment changes.
3. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
4. Character Height: 1 inch.
5. Sign Height: 4-6 inches, unless otherwise indicated.
6. Where signs are mounted on glass sidelights, provide blank panel mounted to opposite side of glass to conceal mounting adhesives.

C. Building Safety Signs:
1. Use clear plastic panel silk-screened on reverse, and bonded after printing to laminate backing. Map and text proof submitted by fabricator for approval.
a. Evacuation Maps
1) Provide two maps per floor , locate as directed by Architect and Fire Marshal.
2) Map and text to be provided by Architect
b. Occupancy load sign:
1) Provide at room 2200, maximum occupancy 200.
2) Provide at room 1200, maximum occupancy 99.

2.03 PLAQUES

A. Metal Plaques:
1. Metal: Aluminum casting.
2. Metal Sheet Thickness: 1/4 inch, minimum.
3. Double line edge profile, matte finish painted background , color selected by architect
4. Plaque size: 30" x 36"
5. Mounting: exposed with rosettes.
6. Text: provided by architect.

2.04 ACCESSORIES

A. Concealed Screws: Stainless steel, or other non-corroding metal.

B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Locate signs where indicated:

1. Room and Door Signs: Locate on wall at latch side of door with centerline of sign at 60 inches above finished floor.
2. If no location is indicated obtain Owner's instructions.

D. Protect from damage until Substantial Completion; repair or replace damaged items.

END OF SECTION

SECTION 10 2113.16
PHENOLIC CORE LAMINATE FACED TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Plastic laminate toilet compartments.

B. Urinal screens.

1.02 RELATED REQUIREMENTS

A. Section 10 2800 - Toilet, Bath, and Laundry Accessories.

1.03 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

B. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

C. 36 CFR 1191 - ADA Guidelines , ANSI 117.1

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.

C. Product Data: Provide data on panel construction, color selection options, hardware, and accessories.

D. Color information for selection: Provide data indicating mfg's full range of color and textures. Provide 2 samples of selected finish color and texture.

E. Samples: Submit two samples of partition panels, 4 x 4 inch in size illustrating panel finish, color, and sheen.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Toilet Compartments & Urinal Screens:
   1. General Partitions Mfg. Corp; ____: www.generalpartitions.com/#sle.
   2. Global Steel Products Corp; ____: www.globalpartitions.com/#sle.
   3. Bobrick Washroom Equipment, Inc.
   4. Substitutions: See Instructions to Bidders, Article 13

2.02 MATERIALS

2.03 COMPONENTS

A. Toilet Compartments: floor-mounted headrail-braced.

B. Doors, Panels, and Pilasters: Plastic laminate adhesive and pressure bonded to faces of solid phenolic core, with beveled corners and edges.
   1. Plastic Laminate Color: Provide mfg. option allowing selection from laminate manufacturers full product line , textured, low gloss finish.

C. Door and Panel Dimensions:
   1. Door Thickness: 3/4 inch.
   2. Door Width : 24 inch.
   3. Door Width for Handicapped Use: 36 inch, out-swinging.

4. Height: 58 inch.
5. Thickness of Pilasters: 3/4 inch.
6. Thickness of wall panels 1/2 inch

D. Urinal Screens: Wall mounted with contiuous panel bracket and pilaster shoe

2.04 ACCESSORIES

A. Pilaster Shoes: Formed ASTM A666, Type 304 stainless steel with No. 4 finish, 4 inches high, concealing floor fastenings.
   1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.

B. Head Rails: Hollow anodized aluminum tube, 1 x 1-5/8 inch size or system manufacturers standard, with anti-grip strips and cast socket wall brackets.

C. Wall and Pilaster Brackets: Polished stainless steel.

D. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.

E. Hardware: Polished stainless steel:
   1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.
   2. Thumb turn door latch with exterior emergency access feature.
   3. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
   4. Coat hook with rubber bumper; one per compartment, mounted on door.
   5. Provide door pull for outswinging doors.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 to 1/2 inch space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely through wall finishes to connect with concealed blocking. Use anchor devices and fasteners provided by the partition manufacturer.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.02 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

B. Maximum Variation From Plumb: 1/8 inch.

3.03 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

SECTION 10 2800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Commercial shower and bath accessories.

C. Diaper changing stations.

D. Utility room accessories.

E. Grab bars.

1.02 RELATED REQUIREMENTS

A. Section 09 3000 - Tiling:

B. Section 10 2113.16 - Phenolic Core Laminate Faced Toilet Compartments.

1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; current edition; (ADA Standards for Accessible Design).

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015a.

D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

E. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2008 (Reapproved 2013).

F. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2004, with Editorial Revision (2016).

G. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:
   1. AJW Architectural Products; _____: www.ajw.com/#sle.
   2. American Specialties, Inc; _____: www.americanspecialties.com/#sle.
   3. Bradley Corporation; _____: www.bradleycorp.com/#sle.
   4. Bobrick
   5. Georgia-Pacific Professional; _____: www.blue-connect.com/#sle.
   6. Kutol
   7. Substitutions: See Instructions to Bidders, Article 13

B. Diaper Changing Stations:
   1. American Specialties, Inc; _____: www.americanspecialties.com/#sle.

2. Bradley Corporation; _____: www.bradleycorp.com/#sle.
3. Diaper Deck & Company; _____: www.diaperdeck.com/#sle.
4. Koala Kare Products; _____: www.koalabear.com/#sle.
5. Substitutions: 01 6000 - Product Requirements & SUBSTITUTIONS.

C. Provide products of each category type by single manufacturer.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
1. Grind welded joints smooth.
2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.

B. Stainless Steel Sheet: ASTM A666, Type 304.

C. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

D. Fasteners, Screws, and Bolts: Exposed: Stainless steel, or Concealed: Hot dip galvanized, tamper-proof, security type.

E. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

2.04 COMMERCIAL TOILET ACCESSORIES BASIS OF DESIGN PRODUCTS

A. Toilet Paper Dispenser: single 9" roll, surface mounted,
1. Products:
a. Bradley 5424.
b. Bobrick B 2890.

B. Sanitary Napkin Disposal :
1. Product: [B-254] manufactured by [Bobrick].

C. Paper Towel Dispenser: Electric, roll paper type.
1. Cover: Stainless steel.
2. Paper Discharge: Touchless automatic.
3. Capacity: 6 inch diameter roll.
4. Mounting: Surface mounted.
5. Power: Battery operated.
6. Refill Indicator: Illuminated refill indicator.
7. Products:
a. Georgia-Pacific Professional; GP enMotion Stainless Recessed Automated Touchless Towel Dispenser: www.blue-connect.com/#sle.
b. Tork 86ECO.
c. Substitutions: Section 01 6000 - Product Requirements & SUBSTITUTIONS.

D. Mirror: Stainless steelframed glass mirror.
1. 24 x 36 mirror unit
2. 304 satin stainless steel frame, 3/4" frame face.
3. Vandal resistant mounting
4. Mirror Glass : ASTM C1036, Type 1 transparent flat, Class 1 clear, Quality Q2 (mirror); silvering, protective coating and physical characteristics complying with ASTM C1503.

E. Counter Mounted Waste Chute: Stainless steel.
1. Product: 1000A manufactured by ASI.

F. Waste Receptacle: Stainless steel, freestanding style, .
1. Minimum capacity: 33 gallons.
2. Product: B-2400 manufactured by Bobrick.Satin-finish stainless steel. Removable funnel top with 8 1⁄4" (210mm) diameter opening for hygienic, no-touch disposal of waste. Four

heavy-duty rubber feet. Rigid plastic liner waste container has handle for easy removal. Capacity: 33-gal. (125-L). Unit 18 1⁄4" diameter, 32" high (465 x 815mm).

G. Waste Receptacle: Stainless steel, in cabinet style, .
   1. Minimum capacity: 21 gallons.
   2. Product: B2280 manufactured by Bobrick.Satin-finish stainless steel. Unit 15" x 15" x 29" high

H. Soap Dispenser:
   1. Products:
      a. Kutol 9909ZPL DuraView black hand soap dispenser .

I. Grab Bars: Stainless steel, smooth surface.
   1. Standard Duty Grab Bars:
      a. Push/Pull Point Load: 250 pound-force, minimum.
      b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, concealed flange mounting with snap covers. 1-1/2 inch clearance between wall and inside of grab bar.
      c. Length and Configuration: As indicated on drawings.
      d. Products:
         1) Bobrick B-5806.

J. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
   1. Style: Horizontal.
   2. Material: Stainless steel shell with polyethylene body.
   3. Mounting: Surface.
   4. Minimum Rated Load: 250 lbs.
   5. Manufacturers:
      a. Bradley Corporation : www.bradleycorp.com.
      b. Foundations Worldwide, Inc : www.brocar.com.
      c. Koala Kare Products model # KB110-SSWM: www.koalabear.com.
      d. Substitutions: See Section 01600 - Product Requirements.

2.05 COMMERCIAL SHOWER AND BATH ACCESSORIES

A. Shower Curtain Rod: Stainless steel tube, 1 inch outside diameter, 0.04 inch wall thickness, satin-finished, with 3 inch outside diameter, minimum 0.04 inch thick satin-finished stainless steel flanges, for installation with exposed fasteners.
   1. Product: 9538 manufactured by Bradley.

B. Shower Curtain:
   1. Material: Opaque vinyl, 0.008 inch thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
   2. Color: White.
   3. Shower Curtain Hooks: Chrome-plated or stainless steel spring wire designed for snap closure.
   4. Product: 9537 manufactured by Bradley.

C. Folding Shower Seat: Wall-mounted surface; welded tubular seat frame, structural support members, swing-down legs, hinges, and mechanical fasteners of Type 304 stainless steel, L shaped (refer to plan for hand) seat.
   1. Seat: Phenolic or polymeric composite one-piece seat or seat slats, of color as selected.
   2. Size: ADA Standards compliant.
   3. Product: 9562 manufactured by Bradley.

D. Wall-Mounted Soap Dish: Heavy duty, seamless stainless steel, surface-mounted with drain holes, without grab bar, satin finish; with concealed mechanical fastening suitable for substrate and backplate.
   1. Product: 9014 manufactured by Bradley.

E. Robe Hook: Heavy-duty stainless steel, single-prong, rectangular-shaped bracket and backplate for concealed attachment, satin finish.
   1. Product: 9114 manufactured by Bradley.

2.06 UTILITY ROOM ACCESSORIES

A. Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, hat-shaped channel.
   1. Holders: Three spring-loaded rubber cam holders.
   2. Length: 24 inches.
   3. Product: B-223 manufactured by Bobrick.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify that field measurements are as indicated on drawings.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As indicated on the drawings.
   1. Grab Bars: As indicated on drawings.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 4400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguisher cabinets.

B. Accessories.

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 FIRE EXTINGUISHER CABINETS

A. Product: Basis of design Larson's Manufacturing Company; Cameo Series.

B. Metal: Formed aluminum; 1/16 inch thick.

C. Cabinet Configuration: Semi-recessed type.
   1. Size to accommodate accessories.
   2. Interior nominal dimensions of 9 1/2 inch wide x 24 inch high x 3 1/2 inch deep.
   3. Trim: Flat square edge, with ____ inch wide face.

D. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinge.

E. Door Glazing: Acrylic plastic, clear, 1/8 inch thick, flat shape and set in resilient channel glazing gasket.

F. Weld, fill, and grind components smooth.

G. Finish of Cabinet Exterior Trim and Door: No. 4 - Brushed stainless steel.

H. Finish of Cabinet Interior: White colored enamel.

2.03 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

B. Cabinet Signage: FIRE EXTINGUISHER.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify locations of cabinets through a site visit by the local fire marshal , scheduled by the GC,

C. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, ____ inches from finished floor to inside bottom of cabinet.

C. Secure rigidly in place.

3.03 SCHEDULES

A. Provide 12 cabinets. Locations are shown on project drawings.

END OF SECTION

SECTION 10 5126
PLASTIC LOCKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Solid plastic lockers.

B. Locker benches.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking and nailers.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

C. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2015.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's published data on locker construction, sizes and accessories.

C. Shop Drawings: Indicate locker plan layout, numbering plan and combination lock code.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect locker finish and adjacent surfaces from damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Solid Plastic Lockers:
   1. Columbia Lockers, a division of PSiSC; PolyLife Lockers: www.psisc.com/#sle.
   2. Scranton Products; ____: www.scrantonproducts.com/#sle.
   3. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.02 LOCKER APPLICATIONS

A. Wardrobe Lockers: Solid plastic lockers, wall mounted with matching closed base.
   1. Width: 9 inches.
   2. Depth: 12 inches.
   3. Height: 72 inches.
   4. Locker Configuration: Two tier.
   5. Fittings: Size and configuration as indicated on drawings.
      a. Hat shelf.
      b. Hooks: Two single prong.
   6. Locking: Padlock hasps, for padlocks provided by Owner.
   7. Provide sloped top.

B. Locker Benches: Stationary type; bench top of solid high density polyethylene (HDPE); aluminum pedestal pedestals.

2.03 SOLID PLASTIC LOCKERS

A. Lockers: Factory assembled, made of solid plastic panels, homogenous color throughout.
   1. Material: Solid high density polyethylene (HDPE).
   2. Doors: Full overlay without frame.
   3. Locker Body Construction: Manufacturer's standard for selected product.
   4. Where locker ends or sides are exposed, provide same finish as fronts or provide extra panels to match fronts.

5. Door Color: To be selected by Architect.
6. Body Color: Manufacturer's standard white or light color.

B. Component Thicknesses:
1. Doors: 1/2 inch minimum thickness.

C. Hinges: Full height of locker, manufacturer's standard heavy duty type.

D. Number Plates: Provide rectangular shaped aluminum plates. Form numbers ____ inch high of block font style with ADA designation, in contrasting color.

E. Built-In Lock Boxes: Same material as locker, manufacturer's standard size, with padlock hasps, for padlocks provided by Owner.

F. Locker Base: Solid plastic base, 4 inches high, field assembled.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Place and secure on prepared base.

C. Install lockers plumb and square.

D. Install end panels, filler panels, and sloped tops.

E. Install fittings if not factory installed.

F. Replace components that do not operate smoothly.

3.02 CLEANING

A. Clean locker interiors and exterior surfaces.

END OF SECTION

SECTION 10 5626
MOBILE STORAGE SHELVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Mechanically assisted mobile storage shelving systems.

1.02 RELATED REQUIREMENTS

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 C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2016a.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
   1. System components.
   2. Accessories.
   3. Substrate preparation instructions and recommendations.
   4. Storage and handling requirements and recommendations.
   5. Installation methods.

C. Shop Drawings: Indicate location, type, and layout of mobile storage shelving system, including lengths, heights, and aisle layout, and relationship to adjacent construction.
   1. Indicate location and configuration of rails.
   2. Indicate method of installation and configuration for shelving mounted on carriages.
   3. Provide location and details of anchorage devices to be embedded in or fastened to the structure.

D. Selection Samples: For each finish product specified, provide color chips representing manufacturer's full range of available colors and finishes.

E. Design Data: Provide design calculations, bearing seal and signature of structural engineer licensed to practice in the State in which the Project is located, showing loads at points of attachment to the building structure.

F. Test Reports: Provide independent agency test reports documenting compliance with specified structural requirements.
   1. In lieu of test reports, detailed drawings stamped and sealed by a Professional Engineer licensed in the State in which the Project is located will be acceptable.

G. Warranty: 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. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Inspect for dents, scratches, or other damage. Replace damaged components.

B. Store in manufacturer's unopened packaging until ready for installation.

C. Store under cover and elevated above grade.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty covering defects of manufacturing and workmanship and rust and corrosion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Mobile Storage Shelving Systems:
   1. Basis of design product: SpaceSaver Corporation; www.spacesaver.com/#sle.
   2. Datum Storage Solutions: www.datumstorage.com/#sle.
   3. Montel: www.montel.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.02 MOBILE STORAGE SHELVING SYSTEMS - GENERAL

A. System Description: High-density movable shelving system consisting of shelving units mounted on rail-guided wheeled carriages.
   1. Carriage Operation: Mechanically assisted.
   2. Carriage Capacity: Equivalent to basis of design.
   3. Rail Mounting: Surface mounted directly on floor without grout, plywood, or shims.

B. Components:
   1. Carriages: Rectangular steel frames of type and size required for selected system.
      a. Finish: Powder coat paint; color to match shelving.
   2. Wheels: Cold rolled steel; dual flanged.
   3. Rails: Cold rolled steel; type and size to carry loads imposed by system.
   4. Subrails: Aluminum; use as required for recessed rails.
   5. Floor Panels: Underlayment grade plywood, 3/4 inch thick.
   6. Ramps: Steel; 9 degrees maximum slope.
   7. Floor Covering: Carpet, factory applied as part of modular floor.
   8. Face Panels: Steel; full height and width of shelving.
      a. Color: To match shelving.
   9. Grout: Non-shrink hydraulic type cement.
      a. Minimum Compressive Strength at 7 Days: 8,000 pounds per square inch when tested according to ASTM C109/C109M.

C. Accessories:
   1. Anchors and Leveling Screws: Types and sizes recommended by manufacturer for specified rail mounting and floor system.
   2. Bumpers: Manufacturer's standard rubber stops.

2.03 MECHANICALLY ASSISTED MOBILE STORAGE SHELVING SYSTEMS

A. Basis of Design: Space Saver .

B. Drive System: Provide uniform movement of the carriage without drifting or jerking.
   1. Chain and sprocket system with full length torque resistant steel shaft.
   2. Provide two wheels per rail for each carriage, direct-driven on one side.

C. Control: Three-spoke operating handle with manual locking latch.
   1. Minimum Gear Ratio: 1 lbf to move a load of 6000 lbs.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that substrate is in proper condition to install rails and flooring system per manufacturer's requirements.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION

A. General: Install system components and accessories in accordance with manufacturer's printed instructions.

B. Position system components level and plumb within manufacturer's specified tolerances.

C. Anchor rails directly to concrete subfloor.

D. Extend rails under stationary shelving units.

E. Position carriages ensuring wheels align properly on rails. Fasten multiple carriages together forming a single movable base.

F. Install shelving with shelf surfaces level and vertical supports plumb; fasten to carriage supports with vibration-proof fasteners.

3.03 ADJUSTING

A. Adjust mobile storage shelving components and accessories to provide for smooth operation of system.

3.04 CLEANING

A. Clean shelving and surrounding area after installation.

3.05 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Instructor: Manufacturer's authorized representative.
   3. Location: At project site.

3.06 PROTECTION

A. Protect installed system from subsequent construction operations.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 11 1420
PEDESTRIAN SECURITY GATE

PART I - GENERAL

1.01 SECTION INCLUDES

A. This section covers the furnishing and installation of an MSG gate with a 48” opening.

1.02 QUALITY ASSURANCE

A. Manufacturer shall be a company specializing in the manufacture of security gates for a minimum of 10 years.

B. Installer shall have at least one year experience installing similar equipment, or shall supply a factory representative during installation of the product.

1.03 SUBMITTALS

A. Submit manufacturer’s descriptive literature for specified equipment, including options.

B. Provide, upon request, site specific drawings showing product placement.

C. Provide installation and operation manuals.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to job site in manufacturer’s packaging undamaged, complete with installation instructions.

B. Store off ground, under cover, protected from weather, construction activities and debris.

C. Use forklift, pallet jack or equivalent equipment for moving.

1.05 PROJECT/SITE CONDITIONS

A. Install on a level concrete pad. Secure to adjacent fencing.

PART II - PRODUCTS

2.01 MANUFACTURER

A. Alvarado Mfg. Co., Inc. 12660 Colony Street, Chino, CA 91710. +1 909.423.4143, or email information@alvaradomfg.com.

2.02 PRODUCT

A. MSG Full Height Security Gate. Features of the gate shall include: stainless steel pull handle in the entry direction; no door hardware in the exit direction and a hydraulic closure mechanism, Norton Model #7500.

2.03 CONSTRUCTION

A. Gate:
   1. The Gate is a fully welded assembly consisting of 2” x 3” vertical and 2” x 5” horizontal structural steel tubing. Vertical infill bars of 1.5” square tubing are spaced evenly across the width of the gate.

B. Gate Frame:
   1. The Gate Frame is a fully welded assembly consisting of 2” square vertical and 2” x 5” horizontal structural steel tubing. The frame includes two welded .25” thick base plates for mounting to a concrete slab.

C. Hydraulic Closure:
   1. The hydraulic gate closure mechanism is a Norton Model #7500.

D. All other hardware is specified under Section 08 7100 Door Hardware.

E. Access control will be provided by owner.

2.04 FINISH

A. Powder Coat over Galvanized: The gate is fabricated from steel, hot-dip galvanized and then painted in a powder coat color specified by the project requirements.

2.05 OPTIONS

A. Infill Mesh: Infill mesh is added to the upper and lower sections of the gate.

2.06 FACTORY TESTING

A. Product shall be fully tested at the factory prior to shipment.

B. Inspect product finish. Touch up prior to shipment.

PART III - EXECUTION

3.01 SITE EXAMINATION

A. Inspection: Installer must examine the installation location and advise the Contractor of any site conditions inconsistent with proper installation of the product. Installation shall not begin until unacceptable conditions are rectified. These conditions include but are not limited to the following:
   1. Gate must be installed on a level concrete pad.

B. Installation: Install in accordance with manufacturer’s instructions and secure to adjacent solidly anchored structure or equipment.

C. Adjustment: Adjust gate closure after installation.

D. Instruction: A factory trained installer shall demonstrate to the owner’s maintenance crew, or designated representative, the proper operation and the necessary service requirements of the equipment, including exterior maintenance.

E. Cleaning: Clean gate and area carefully after installation to remove excess caulk, dirt and labels.

END OF SECTION

SECTION 11 1500
MOTORIZED OPTICAL TURNSTYLE

PART I - GENERAL

1.01 SECTION INCLUDES

A. This section covers the furnishing and installation of the SU3000 Optical Turnstile.

B. For further information, contact Alvarado at +1 909.591.8431, or information@alvaradomfg.com.

1.02 REFERENCES

A. L.A. Testing Laboratories, per UL325.

1.03 QUALITY ASSURANCE

A. Manufacturer shall be a company specializing in the manufacture of motorized optical security turnstiles and shall have a minimum of 5 years' experience.

B. Installer shall have a minimum of three years' experience installing similar equipment, or shall supply a factory-trained supervisor during installation of the product.

1.04 SUBMITTALS

A. manufacturer's descriptive literature for specified equipment, including options.

B. site specific drawings and / or installation templates, showing product placement.

C. Provide installation and operation manuals.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to job site in manufacturer's packaging undamaged, complete with installation instructions.

B. Store indoors in a controlled environment, protected from weather, construction activities and debris.

C. Use forklift, pallet jack or equivalent equipment for moving.

1.06 PROJECT/SITE CONDITIONS

A. Install on a level floor.

PART II - PRODUCTS

2.01 MANUFACTURER

A. Alvarado Mfg. Co., Inc. 12660 Colony Street, Chino, CA 91710 - USA.+1 909.591.8431, or information@alvaradomfg.com.

2.02 PRODUCT

A. SU3000 Motorized Barrier Arm Optical Turnstile Include the following options: GateKeeper Control and Monitoring Software.

2.03 CONSTRUCTION

A. Exterior: #304 stainless steel, #4 satin finish.

B. Interior Frame: Black, powder coated steel with openings for conduit.

C. Decorative Lid: Solid surface acrylic; Manufacturer: Livingstone; Color: Starry Night Black.

D. Moving Barriers:
   1. Moving Barriers: Two barrier arms fabricated from 1.75" (44mm) aluminum tubing with a clear anodized finish.

2.04 DIMENSIONS

A. Passage Opening:
   1. Standard: 28" (711mm)
   2. Special Needs: 36" (914mm)

B. Left and Right End Cabinets:
   1. Length: 48” (1219mm)
   2. Height: 38.4” (977mm)
   3. Width nominal: 5.5” (140mm)

C. Center Expansion Cabinets:
   1. Length: 48” (1219mm)
   2. Height: 38.4” (977mm)
   3. Width nominal: 5.5” (140mm)

D. Moving Barrier Heights:
   1. 33” (838mm)

2.05 EQUIPMENT

A. Types of Units: The installation shall consist of end and center lanes, as required by the installation. Center cabinets shall have the same height, length and nominal width dimensions as end cabinets. Units shall be bi-directional in operation.

B. Passage Modes:
   1. Controlled Passage: Each patron must present a valid electronic credential to the integrated reader before passage is allowed. Upon receipt of an authorization signal from the access control system, the barriers open and allow a single passage in the authorized direction. The barriers return to the closed position after the user has passed through the turnstile or the time frame allowed for entry expires. The turnstile will buffer multiple inputs to maximize throughput.
   2. Free Passage: All patrons are allowed to pass. The barriers open when the first sensor in the cabinet array is activated and close when the patron passes through the turnstile.
      a. No Passage (Direction Closed): No passage is allowed. Valid electronic credentials are ignored.
      b. Visitor: Allows visitors and groups without credentials access through the turnstile. When placed in Visitor Mode, the barriers remain open. Passages in either direction are monitored and an output is provided for each passage.

C. Operating Modes:
   1. Normally Closed: The barriers are closed, securing the turnstile.
   2. Barrier Open: The barriers are down, providing a barrier-free passageway. The barriers will not raise and secure the turnstile unless unauthorized passage or tailgating is attempted.
      a. Barrier Disabled: The barriers remain open, allowing the unit to function as a barrier free optical turnstile.
      b. Emergency: Activation to open the barriers in conjunction with a fire alarm or similar system. When activated, the barriers open in the exit direction and remain open until deactivated.
      c. Power Failure: In the event of loss of power, the barriers drop providing an open passageway.

D. Optical Detection:
   1. Strategically placed optical sensors and a sophisticated detection algorithm detects patrons, determines the direction of patron movement, and (in conjunction with the facility access control system) detects unauthorized users.
   2. Each sensor to consist of a separate transmitter and receiver operating on a high-speed communication bus.
   3. The sensors and system:
      a. Must have the capability of tracking a user’s passage from entry to exit point
      b. Must consistently detect closely following tailgaters on allowed entries while avoiding generating false alarms for commonly carried objects
      c. Must detect patrons travelling in the opposite direction when passage has been allowed
         1) Sensitivity settings to be adjustable via an included configuration utility.

2) Sensor operation shall not be affected by natural or indoor lighting.
3) Sensors to be deployed at various heights to detect persons crawling through the passage area.
4) Safety sensors shall be present to prevent the barriers from closing or opening when persons or objects are the barrier field of travel.

d. The optical system to provide superior processing speed and throughput of up to one person per second, subject to the access control system limitations.

E. Motor and Motor Control:
1. Barrier movement must be:
a. Accomplished via brushless DC motor / planetary gearbox combination utilizing digital position closed loop motor control.
b. Smooth and controlled for all sized barriers; no shimmying or wobbling during opening or closing.
c. Self-aligning so that barriers always align in the home or closed position.
1) Barriers to detect impact with an object or obstruction during the opening or closing cycle so as to minimize impact with a person, object or obstruction.
d. Unit to have an integrated electromechanical lock which secures the barriers against forced entry in the home or closed position.

F. System Integration:
1. Units shall integrate with third-party access control systems through the use of dry contact inputs and outputs.
2. Custom methods of integration (through TCP commands) shall be available.
3. Available Inputs: Available inputs shall include:
a. Passage allowed, access granted x 2
b. Passage denied, access denied x 2
c. Direction closed, no passage x 2
d. Direction open, free passage x 2
e. Visitor allowed, access granted x 2
f. Single override entry x 2
g. Barrier open x 1
h. Disable barrier x 1
i. Emergency override x 1
j. TCP port
k. Available Outputs: Available outputs shall include:
1) Authorized passage x 2
2) Unauthorized passage x 2
3) Unauthorized presence x 2
4) Free passage x 2
5) Sensor blocked x 1
6) Barrier held open x 1
7) Barrier breakaway x 1
l. Configuration Capabilities: Units shall come with Alvarado's LaneConfig, which is a web-based utility that allows the installer to conveniently configure settings for installed turnstiles. The utility must allow dissemination of operational settings for a single unit, or all installed units, over an Ethernet network. Configurable unit features available from the web-based utility to include:
1) User definable operational and alarm sounds
2) Access timeout configuration
3) Object size and tailgating sensitivity
4) Unauthorized entry sensor control
5) Electromechanical brake use and barrier breakaway force
6) Barrier impact force
7) Blocked sensor time
8) Alarm duration

9) Emergency override barrier movement direction

m. Diagnostic Capabilities: The web-based utility shall also provide the following diagnostic capabilities:
   1) Operational debug
   2) Optic debug
   3) Motor I/O debug

n. Power: Power requirements are as follows:
   1) 110/220 VAC run to master controller cabinet; power stepped down to 24/12/5VDC for operation.
   2) Power / digital signals run between cabinets via a conduit run interconnect cable.

G. User Interface:
1. Enter / Exit User Status Display: The unit to have LED illuminated user status icons visible looking down on the lid, on each side of the unit. User status icons to be as follows:
   a. An illuminated yellow means the turnstile is ready for card presentation.
   b. An illuminated green means valid credentials have been presented and / or passage is allowed in the direction of the arrow.
   c. An illuminated red X symbol means that passage is prohibited in the direction of the arrow.
   d. A flashing red stop X symbol means invalid credentials have been presented or the turnstile has an alarm condition.
      1) Open / Closed Status Lights: The unit to have an opaque end piece mounted to the upper end “leg” of each side of the turnstile diffusing green and red signal LED’s. The lights to function as follows:
         (a) Green consistently illuminated means the turnstile is open for use.
         (b) Red consistently illuminated shall signify the turnstile is closed for use.
         (c) A flashing red shall signify an alarm condition.
         (d) The timing and length of illumination shall be user definable for select alarms.
      2) User Definable Sounds: Each unit shall allow user to define the duration and type of audible sounds (in the form of .wav files) that play for the following alarms and operations.
         (a) Access accepted
         (b) Access denied
         (c) Unauthorized presence
         (d) Unauthorized passage
         (e) Blocked sensor
         (f) Unsafe to open / close barrier
         (g) Barrier breakaway
         (h) Barrier impact
         (i) Barrier lingering
         (j) Appropriate startup

H. Operator Interface for Control:
1. Control Software: Alvarado’s GateKeeper web-based control and monitoring software shall be provided. Communication between the control software and the units shall be TCP/IP.
2. Features of Control Software: The software shall include or provide:
   a. Three different levels of access, with the level of access dependent on the level of the operator. Access levels shall be password protected.
   b. Real time status of installed units.
   c. Change of operational status modes in real time.
   d. Monitoring of alarm conditions and screen alerts showing alarm conditions.
      1) Ability to place individual or all units in emergency override condition.
      2) Ability to allow a single passage through an individual lane in either direction.
      3) Apply settings/changes to one or all units.

4) Event Scheduler: An integrated event scheduler allowing modes and access direction settings to be changed automatically at scheduled times.
5) Reporting: A detailed log of all activity for defined periods.

2.06 OPTIONS

A. Baseplates: Baseplate for either a single turnstile or multi-turnstile configurations. Power coated black with a sprayed non-slip coating in walkway area. Baseplate houses interconnection cable.

B. External Power Supply: Portable enclosure provided for remote installation of unit primary power supply. One enclosure houses up to three power supplies (one power supply required per turnstile). Distance and wire gauge limitations apply.

C. Monitoring and Operational Mode Scheduling Software (GateKeeper): Web-based communication and control software.

D. Turnstile Key Controls: 3-position key switches installed in turnstile cabinet provide quick method of placing the turnstile direction in Controlled Passage, Free Passage or No Passage mode.

2.07 FACTORY TESTING

A. Product shall be fully assembled at the factory.

B. Check all mechanical connections.

C. Check all electrical connections.

D. Provide 24-hr factory burn in testing.

E. Inspect product finish. Touch up prior to packaging.

PART III - EXECUTION

3.01 SITE EXAMINATION

A. Inspection: Installer must examine the installation location and advise the Contractor of any site conditions inconsistent with proper installation of the product. Installation shall not begin until unacceptable conditions are rectified. These conditions include but are not limited to the following:
   1. Floor must be level within the footprint of the turnstile.
   2. Primary power must be installed prior to turnstile installation.
   3. Power and communication wiring to come from the floor through conduit stub up locations per manufacturer directions, or via alternate methods if manufacturer is contacted and approves.

B. Installation: Install turnstiles in accordance with manufacturer instructions. Installer to be factory trained or a factory representative shall be present to oversee installation.

C. Adjustment: Installer shall adjust turnstiles for proper performance after installation.

D. Instruction: A factory trained installer shall demonstrate to the owner’s maintenance crew, or designated representative, the proper operation and the necessary service requirements of the equipment.

E. Cleaning: Clean metal and optic surfaces carefully after installation to remove excess caulk, dirt and labels following the manufacturer directions.

END OF SECTION

SECTION 11 5213
FLAT SCREEN TV MOUNTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flat Screen TV mounts.

1.02 RELATED REQUIREMENTS

A. Section 09 5100 - Acoustical Ceilings: Suspended panel ceilings for recessed screens.

B. Section 26 0583 - Wiring Connections: Electrical supply, conduit, and wiring for electric motor operated projection screens.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's catalog cuts and descriptive information on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Wiring diagrams for motor operators and actuators, and controls and switches.

C. Manufacturer's Qualification Statement.

D. Operation and Maintenance Data: Provide manufacturer's operation and maintenance instructions.

E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver TV mounts to project site in manufacturer's original unopened packaging, and inspect for damage and proper size before accepting delivery.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide 1 year manufacturer warranty for projection screen assembly.

PART 2 PRODUCTS

2.01 OVERHEAD TV SUPPORT BRACKETS

A. Manufacturers:
   1. Mount It
   2. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

B. Single tube, Full Motion Ceiling Mounting Bracket . Factory assembled unless otherwise indicated.
   1. Supporting 100 lb maximum. Screens up to 60" . Extension from structure above adjustable 41.7" min. 61.7" maximum. 360 degree horizontal rotation, 25 degree tilt.
   2. In Jury Assembly Room: Fixed, _____, ceiling mounted.
      a. Basis of Design Product: Model MI-5098 manufactured by Mount It.

C. Provide mounting hardware, brackets, supports, fasteners, and other mounting accessories required for a complete installation, in accordance with manufacturer's recommendations for specified substrates and mountings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate is finished and ready to accept screen installation.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Do not install TV mounts until climate control systems are in place and interior painting and other finishes are completed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions, using manufacturer's recommended hardware for relevant substrates.

B. Install plumb and level.

C. Adjust mounts and install owner furnished flat screen for proper placement and operation.

3.03 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

SECTION 12 3600
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for architectural cabinet work.

B. Wall-hung counters and vanity tops.

C. Window Stools.

1.02 RELATED REQUIREMENTS

A. Section 12 3100 - Manufactured Metal Casework.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2009.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

C. AWI (QCP) - Quality Certification Program; current edition at www.awiqcp.org.

D. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

E. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

F. PS 1 - Structural Plywood; 2009.

1.04 SUBMITTALS

A. See Section 01 3000 - 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. Verification Samples: For each finish product selected, minimum size 6 inches square, representing actual product, color, and patterns.

F. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

G. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

H. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 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.

B. Fabricator Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

C. 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 designated labels on shop drawings as required by certification program.
   3. Provide designated labels on installed products as required by certification program.
   4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Quality Standard: See Section 12 3100.

B. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
   1. Laminate Sheet, Type ___: NEMA LD 3, Grade HGS, 0.048 inch nominal thickness.
      a. Finish: Matte or suede, gloss rating of 5 to 20.
      b. Surface Color and Pattern: As selected by Architect from the manufacturer's full line.
      c. Manufacturers:
         1) Formica Corporation : www.formica.com.
         2) Lamin-Art, Inc : www.laminart.com.
         3) Panolam Industries International, IncNevamar : www.nevamar.com.
         4) Panolam Industries International, IncPionite : www.pionitelaminates.com.
         5) Wilsonart International, Inc : www.wilsonart.com.
         6) Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.
   2. Exposed Edge Treatment: Square, substrate built up to minimum 1-1/4 inch thick; covered with matching laminate.
   3. Back and End Splashes: Same material, same construction.

C. Solid Surfacing Countertops and Window Stools: Solid surfacing sheet or plastic resin casting _____.
   1. Flat Sheet Thickness: 1/2 inch, minimum.
   2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
      a. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      b. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
      c. Color and Pattern: As selected by Architect from manufacturer's full line.
      d. Manufacturers:
         1) Dupont : www.corian.com.
         2) Formica Corporation : www.formica.com.
         3) Avonite Surfaces : www.avonitesurfaces.com.
         4) Wilsonart International, Inc : www.wilsonart.com.
         5) Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.
   3. Other Components Thickness: 1/2 inch, minimum.
   4. Exposed Edge Treatment at Countertops: Built up to minimum 1-1/4 inch thick; square edge; use marine edge at sinks.
   5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
   6. Skirts: As indicated on drawings.
   7. Window Stools: As indicated on drawings.

2.02 MATERIALS

A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.

B. Particleboard for Supporting Substrate: ANSI A208.1 Grade 2-M-2, 45 pcf minimum density; minimum 3/4 inch thick; join lengths using metal splines.

C. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

D. Joint Sealant: Mildew-resistant silicone sealant, color to minimize contrast with finished product.

2.03 FABRICATION

A. Use plywood substraight specified at all tops with sink and lavatory cut outs.

B. 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 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.
   4. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
      a. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
      b. Height: 4 inches, unless otherwise indicated.
   5. Solid Surfacing: Fabricate tops and wall panels up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

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. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch.

C. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.

B. Field Joints, butt joints to building partitions and walls: 1/8 inch wide, maximum.

3.05 CLEANING

A. Clean countertops surfaces thoroughly.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Replace damaged products before Substantial Completion.

END OF SECTION

SECTION 12 4813
ENTRANCE FLOOR MATS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rubber mat.

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating properties of walk-off surface, adhesive.

C. Shop Drawings: Indicate dimensions and linear pattern direction in each space.

D. Samples: Submit two samples, 4x4 inch in size illustrating pattern, color, finish.

E. Maintenance Data: Include cleaning instructions, stain removal procedures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Floor Mats:
   1. Basis of Design: Pawling Corporation - Dura-Tile Roll; www.pawling.com.

2.02 MATS

A. Rubber Mat: 3/8 inch thick, recycled tire, linear surface pattern, square edges. Provide roll product, minimize end seams.
   1. Color: As selected by Architect from manufacturer's standard range.
   2. Size & location: refer to room finish schedule and project floor plans

B. Recessed Frame: 1/4" inch thick zinc exposed top strip, zinc coated steel concealed bottom strip, 1/8 inch deep, with anchoring features.

2.03 FABRICATION

A. Construct recessed mat frames square, tight joints at corners, rigid. Coat surfaces with protective coating where in contact with cementitious materials.

B. Fabricate mats in single unit sizes as indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that floor surfaces for mats are ready to receive work.

3.02 PREPARATION

A. Condition product by storing in the building under climate controlled conditions. Un roll, remove packaging and store product flat for adequate duration to remove curl or other conditions that will interfer with adhesive installation producing a flat installation with no offsets.

B. Mats: Verify dimensions before cutting mats. Minimize end seams.

C. Prepare slab per adhesive manufacturer's recommendations.

3.03 INSTALLATION

A. Install frames to achieve flush plane with finished floor surface.

B. Install walk-off surface in compliance with manufactures recommendations using adhesive process to maximize durability of installation. .

3.04 TOLERANCES

A. Maximum Gap Formed at joints with wall surface 1/8 inch.

END OF SECTION

SECTION 12 6100
FIXED SEATING - JURY ASSEMBLY ROOM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fixed, upholstered chairs.

1.02 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, chair layouts and dimensions.
   1. Field Measurements: Verify seating layout by field measurements and record field dimensions on shop drawings.

D. Selection Samples: Manufacturer's color charts and swatches for fabric upholstery, indicating full range of materials, colors, and patterns available.

E. Verification Samples: Full-size of each type of chair specified, including all accessories and illustrating all finishes and workmanship to be expected in the finished Work; approved sample may be incorporated into the Work.

F. Maintenance Materials:
   1. Extra Seats: 5 seats, not less than 2 of each type and width of seat, furnished from same production run as that installed.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer certified in writing by the seating manufacturer to be qualified for installation of specified seating.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver seats to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.

B. Store seating units in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.

PART 2 PRODUCTS

2.01 MANUFACTURERS & PRODUCT

A. Jury Assembly Chairs
   1. Norix Furniture , Terra , Sled Base, Open Arm, Guest Chair www.norix.com
      a. Available through Tsantes & Associates, Inc. 13663 Providence Rd. Suite 380 ,Matthews, NC 28104, keith@tsantes.us
   2. Kimbal Seating, Sycamore, Metal, Guest Chair,
      a. Available through Kimball®| 3976-1 Blair Place | Southport, NC 28461| karen.kontoulas@kimball.com

B. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

2.02 MATERIALS

A. Steel Plates, Bars, and Tubes: ASTM A36/A36M.

B. Upholstery Fabric: B level vinyl, Stinson Cassidy; color and pattern to be selected by Architect .
   1. Above fabric designation is intended to establish fabric material; weight, weave, surface texture, pattern, and color required. Products by other manufacturers that match the

specified product in all essential respects may be substituted, with Architect 's prior approval.

2.03 UPHOLSTERED CHAIRS

A. Seats and backs are constructed with heavy duty wood encased in foam.

B. Arm caps; polyurethane

C. Frames are constructed with black, taupe or silver finished steel tube.

D. Upholstery , double stitched and attached with hidden staples and secure hardware assuring the product is safe and tamper resistant.

E. Chairs are to be attached to the floor using steel clips provided by the MFG for this purpose.

F. Installation shall follow furniture arrangement shown in the project drawings.

END OF SECTION

SECTION 12 6760
PEWS AND COURTROOM FURNITURE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fixed, non-upholstered bench with back seating.

1.02 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, Dimensioned installation plan for each courtroom, typical section detailing the pew construction . .
   1. Field Measurements: Verify seating layout by field measurements and record field dimensions on shop drawings.

D. Samples: Submit two samples of wood, [3 by 3] inch (76 by 76 mm) minimum in size illustrating wood grain, stain color, and sheen.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver pews to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.

B. Store units in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fixed Courtroom Pews:
   1. Rueger Chuch Furnishing, Jefferson City, Tenn.
   2. Kivetts, Inc.; www.kivetts.com.
   3. Ratigan-Schottler Manufacturing; www.ratiganschottler.com.
   4. Sauder Courtroom Furniture; www.saudercourtroom.com.

B. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

C. Provide all theater seating by one manufacturer.

2.02 MATERIALS

A. Steel Plates, Bars, and Tubes: ASTM A36/A36M.

B. Exposed Hardwood: Solid lumber selected for absence of visible defects; northern hard maple or white oak.

2.03 NON-UPHOLSTERED CHAIRS

A. Fixed seating pew designed using common middle support standards in each row and aisle standards aligned as indicated on drawings. Width of seats not less than 21 inches, except exit seat locations may be reduced to 20 inches to complete specific row dimensions.

B. End Panels: One piece panels fastened securely to aisle standards with concealed fasteners, configured as follows:
   1. Shape: Rectangular.
   2. Finish: Solid hardwood laminated .

2.04 STANDARDS

2.05 FINISHES

A. Hardwood: Manufacturer's standard clear low-gloss finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of fixed theater seating. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Comply with manufacturer's installation instructions and approved shop drawings.

B. Anchor support standards securely to substrate with at least two anchoring devices recommended by manufacturer.
   1. Place standards in each row laterally so the standards at the aisle will be in alignment.

3.03 ADJUSTING

A. Repair minor abrasions and imperfections in painted finishes with a coating that matches factory-applied finish; replace units that cannot be repaired to unblemished appearance.

END OF SECTION

SECTION 210000 – FIRE PROTECTION

210001 GENERAL

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

B. Contractor shall provide coordination drawings for Division 1.

C. Fire Protection work shall be performed as outlined in “Information for Bidders”.

D. These specifications and the accompanying fire protection drawings are intended to provide for all labor, materials and equipment necessary for the installation of a complete

1. Wet-pipe sprinkler system

and accessories including necessary apparatus, valves and fittings hereinafter described or called for on the fire protection drawings accompanying these specifications.

E. All fire protection work shall be installed in accordance with the following Codes and all Local Ordinances. Codes shall be latest editions approved by the NC Building Code Council with North Carolina amendments. Materials, equipment and workmanship shall be as hereinafter specified.

1. North Carolina State Building Code
2. North Carolina State Fire Prevention Code
3. NFPA 70
4. NFPA 13

F. All products used as part of the installation of the fire sprinkler system shall be Underwriter’s Laboratories (UL) or Factory Mutual (F.M.) approved as required by NFPA 13.

G. This contractor shall secure all required permits and inspection fees necessary for this work. Permits may be secured from the Building Inspections Department.

H. The accompanying drawings are schematic only and are not intended to show all fittings, couplings, hangers, offsets, etc., unless specifically dimensioned. The layout shown on the drawings is a conceptual layout only. This contractor shall provide complete installation drawings for the sprinkler systems defined herein, per the Contract Drawings and these specifications. 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. Fire protection consultant drawings should not be scaled. Secure dimensions from Architectural drawings. Refer to drawings of other trades and coordinate with other contractors. All equipment shall be installed in accordance with the manufacturer’s published installation instructions and diagrams.

210002 SCOPE OF WORK

A. The Contractor shall be required to perform all the following work, in general and provide a complete fire sprinkler system(s) as shown on the plans. This Contractor’s scope of work is limited to inside of the building. The items in general are to be as follows:

1. Furnish and install complete wet-pipe sprinkler system as shown on the fire protection drawings and here-in specified.
2. Sprinkler Contractor is responsible for acquiring flow test data, less than one year old, from the local Fire Department, local Water Department, or by performing a flow test. Contractor shall coordinate with and get approval of date, time, and location of flow test from the local Fire Department.

210003 LIST OF MATERIALS, FIXTURES AND EQUIPMENT

A. Sprinkler system design submittal, including shop drawings, hydraulic calculations, and materials, shall be performed by a Professional Engineer registered in the State of North Carolina, or an individual who has Level III or IV certification from the National Institute for Certification in Engineering Technologies (NICET) in Fire Protection Engineering Technology: Water-Based Systems Layout in accordance with NICET 1014.

B. The Sprinkler Contractor shall obtain written approval from the Engineer/Architect for the use of substitute materials claimed as equal to those specified. Such approvals must be obtained as soon after contract awards as possible and before any materials are ordered. Applications for approvals shall be made by the Sprinkler Contractor and not by subcontractors or manufacturer's representative. The Sprinkler Contractor shall submit within ten days following award of contract and written notice to begin the work a complete list of materials proposed for the job. All like items shall be by the same manufacturer. When this list is approved, no further substitutions will be permitted except in unusual or extenuating circumstances. If no list is submitted, the Sprinkler Contractor shall supply materials specified. The Sprinkler Contractor shall review and stamp the submittals as being in accordance with his or her bid and these specifications.

C. The Sprinkler Contractor shall submit a set of installation plan drawings to the Architect before any materials, and equipment to be incorporated in the work has been ordered. **FAXED COPIES WILL NOT BE ACCEPTABLE**. Installation plan drawings shall include:

1. Hydraulic design data, including remote area designation(s), and locations of nodes.
2. Flow test data.
3. All piping, included mains, cross mains, branches, and armovers with sizes indicated.
4. Location of Riser(s).
5. Riser Details.
6. Hanger Details.
7. Locations of sprinkler heads.
8. Sprinkler head legend, indicating the manufacturer and model number of each type of sprinkler head.
9. Location of backflow preventer.
10. Location of fire department connection and associated check valve.
11. Location of backflow preventer test header.
12. Location of inspector's test connection(s).
13. Location of auxiliary drains.
14. Locations of seismic bracing, as well as seismic bracing details, as applicable.
15. Site diagram indicating water supply piping location, sizes, and hydraulic calculation nodes.
16. Preparer's NICET Certification ID or Professional Engineer Seal.
17. Coordination Drawings per Division 1.

D. The Sprinkler Contractor shall submit seismic bracing calculations.

E. The Sprinkler Contractor shall submit a set of hydraulic calculations to the Architect before any materials, and equipment to be incorporated in the work has been ordered. Hydraulic Calculations shall be performed using computer-based software, such as HydraCALC or HASS. **FAXED COPIES WILL NOT BE ACCEPTABLE**. Hydraulic Calculations shall include:

1. Required water density and size of remote area(s), in accordance with NFPA and the Authority Having Jurisdiction.
2. Pressure and flow required for the system(s) to operate properly (after hose allowance has been added).
3. Flow test data. Sprinkler Contractor shall reduce the static pressure, residual pressure, and flow by 10% when performing hydraulic calculations.
4. Node by node analysis of required pressure, required flow, friction losses, and elevation.
5. Flow vs. pressure curves, indicating that sprinkler system curve(s) are sufficiently below flow test curve.

F. The Sprinkler Contractor shall submit a set of manufacturer's submittal data to the Architect before any materials, and equipment to be incorporated in the work has been ordered. **All sprinkler system components shall be UL listed and/or FM approved as required by NFPA 13.** Shop drawings shall include the name and address of the manufacturer and their catalog numbers and trade names clearly marked. All items shall be referenced to the specifications by **specification paragraph number on an index tab**. One complete set of submittal data shall be manufacturer's original published material. **FAXED COPIES WILL NOT BE ACCEPTABLE**. Approval of materials will be based upon the manufacturer's published ratings. Submit shop drawings and/or catalog data for the following material and equipment:

1. Sprinkler Heads
2. Piping, Fittings, and Couplings
3. Valves
4. Gauges
5. Hangers
6. Seismic Bracing

G. Approval of shop drawings and/or submittal data shall not relieve the Sprinkler 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. If data submitted deviates from the contract documents, the Sprinkler Contractor shall point out such deviations in writing and also state reasons for same. All similar items shall insofar as possible be one make and manufacturer. **MANUFACTURER'S MODEL NUMBERS LISTED WITHIN DIVISION 21 SPECIFICATIONS ARE PROVIDED FOR GENERAL INFORMATION ONLY**. Description of product shall take precedence over model numbers.

H. Prior to submitting equipment information, the Contractor shall field verify all necessary dimensions to ensure that all equipment will fit within designated rooms and/or spaces with proper clearances.

I. Failure to submit materials, equipment, etc., the Architect shall assume that all items shall be installed as specified.

210004 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 or her 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.

C. In the event that demolition of existing sprinkler system(s) will require the existing sprinkler system(s) to be rendered temporarily non-operational, Sprinkler Contractor shall notify the local Fire Department at least five days prior to rendering existing sprinkler system(s) non-operational. All shutdowns of existing sprinkler systems shall be scheduled in accordance with, and approved by, the local Fire Department.

210005 WORKMANSHIP

A. Layout:

1. Furnish and install all necessary sleeves, inserts, etc., for walls and partitions. Failure to install such items in time to avoid delaying the general contractor shall result in the Contractor doing all cutting and repairing at his or her own expense.
2. Conceal piping above ceilings. Where piping is installed in areas without ceilings, coordinate with all other exposed items.
3. Provide sprinkler protection below all obstructions 4'-0" and wider per NFA 13.
4. The General Contractor shall paint exposed piping per Division 9 to match surroundings. Sprinkler heads shall not be painted. Any sprinkler head that is painted shall be removed and replaced.
5. All equipment shall be installed in accordance with manufacturer's installation written instructions.
6. All equipment shall be installed such that components do not provide a safety hazard to occupants who come within a close proximity.

B. All equipment and components located on site shall be protected from the weather and damage from construction equipment.

C. Wet-pipe sprinkler system piping:

1. Piping shall be installed level, without slope, unless otherwise indicated on Contract Drawings.
    a. Exception: Piping installed immediately below sloped roofs shall match the slope of the roof.
    b. If sloped piping causes water to be trapped from draining in quantities exceeding 5 gallons, an auxiliary drain shall be provided in an accessible location.
2. 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.
3. All piping shall be routed with a minimum clearance of ten (10) feet from any electrical switchboards, panel boards or telephone backboards.
4. Piping shall be concealed in walls, or above ceilings, unless otherwise indicated on Contract Drawings.
    a. No sprinkler piping shall be covered or concealed until inspected by the Authority Having Jurisdiction, and tested and approved by the Architect.
5. Piping shall not be installed underground.
6. Sprinkler heads shall be installed in the center of ceiling tiles.
7. Sprinkler heads shall be installed on armovers to allow their locations to be adjusted to the center of ceiling tiles.
8. Sprinkler mains, cross mains, and branches shall be at least 1-1/4" in diameter and armovers shall be at least 1" in diameter.
9. Support horizontal black steel pipe with hangers located every 12 feet for piping 1-1/4" or smaller and every 15 feet for all piping 1-1/2" or larger.
10. Armovers longer than 24" shall be supported by hangers per NFPA 13.

210006 CUTTING, PATCHING AND CHASING

A. All cutting and patching shall be in accordance with the "General Conditions" of these specifications.

210007 SEISMIC RESTRAINTS

B. The Contractor shall be responsible for providing restraints to resist the earthquake effects on the sprinkler system(s), per NFPA, local codes, and the Authority Having Jurisdiction. Restraints shall be per Seismic Design Category C.

C. The Contractor shall retain the services of a Professional Engineer registered in the State of North Carolina, or an individual who has Level III or IV certification from the National Institute for Certification in Engineering Technologies (NICET), to design seismic restraint elements required for this project. The engineer's (or NICET-certified individual's) computations, bearing his or her professional

seal or NICET Certification Number, shall accompany shop drawings that show Code compliance. Computations and shop drawings shall be submitted for review prior to the purchasing of materials, equipment, systems and assemblies.

D. The Professional Engineer (or NICET-certified individual) retained by the Contractor for seismic restraint calculations, shall visit the job site upon completion of the seismic restraint installation. This engineer (or NICET-certified individual) shall provide in writing verification of compliance with the approved seismic submittal. This verification shall bear the Engineer's (or NICET-certified individual's) professional seal or NICET Certification Number. Job site inspections by other than this engineer (or NICET-certified individual) is not acceptable.

E. Review of the seismic design and shop drawings by the Engineer/Architect or their agent shall not relieve the Contractor of his or her responsibility to comply with the seismic or any other requirements of the North Carolina State Building Code.

210008 WET-PIPE SPRINKLER SYSTEMS

A. Piping:

1. Sprinkler piping 2" and smaller (minimum 1") shall be Schedule 40 threaded black steel, conforming to ASTM A 795 and ANSI/ASTM A 53.
2. Sprinkler piping 2-1/2" and larger shall be Schedule 10 roll grooved black steel, conforming to ASTM A 795 and ANSI/ASTM A 53.

B. Fittings:

1. Fittings for threaded black steel piping shall be cast iron threaded fittings by Anvil or approved equal.
2. Fittings for grooved black steel piping shall be ductile iron grooved fittings conforming to ASTM A 536. Fittings shall be joined with rigid ductile iron couplings.

210009 HANGERS:

A. Hangers for vertical piping shall be Riser Clamp design.

B. Hangers for horizontal piping shall be hanger rings attached to top beam clamps using 3/8" threaded rod. Top beam clamps shall only be attached to the top portion of structural members. All hangers shall permit adequate adjustment after erection while still supporting the load.

C. Trapeze hangers are allowed only where it is necessary due to the required piping layout and structure.

D. Trapeze hangers shall attach to the structure using top beam clamps located on both sides of trapeze hanger. Top beam clamps shall only be attached to the top portion of structural members. Provide Afcon, Viking, or Anvil.

E. Hangers **SHALL NOT** be fastened to joist bridging or roof deck.

210010 VALVES

A. Valves not specified elsewhere in Division 21 shall be UL listed and/or FM approved as required by NFPA 13, and shall be listed specifically for fire protection service.

210011 PIPE SLEEVES, PLATES, ESCUTCHEONS, ETC.

A. Pipe sleeves shall be standard weight schedule 40 black steel. All sleeves shall be equal to construction thickness except that pipe sleeves passing through floors above grade, shall extend 3/4" above the finished floor. Pipe sleeve sizes shall be sized two pipe sizes larger than piping passing thru the sleeve.

B. Piping thru non-fire rated walls, floors above slab on grade or ceilings shall have sleeves installed concentric and centered on pipe. Ream all sleeves to prevent cutting of piping. The Contractor shall furnish shop drawings to the general contractor and the Architect showing location, dimensions, and sizes of holes required.

C. Install escutcheons snug against room finish on all exposed pipe passing through walls, floors above slab on grade or ceilings. Use cup type escutcheons at floors where sleeves extend above finished floors. Escutcheons shall be chrome plated steel with spring clip as by Keeny, Connecticut Stamping and Bending Company of Dearborne.

D. 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.

E. 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. All openings through horizontal fire separations shall be protected by Metacaulk U.L. Systems or approved U.L. listed system by other manufacturers.

F. All openings through floors and vertical fire separations shall be protected by combination water seal and fire stops as manufactured by Presealed Systems or approved equal by Proset, or approved equal by Metacaulk or 3M.

210012 SPRINKLER SYSTEM IDENTIFICATION:

A. Each individual riser shall be marked with a metal hydraulic placard containing the following data:

1. Location of area protected by riser.
2. Total number of sprinkler heads connected to riser.
3. Design density and design area, as approved.
4. Required flow rate and pressure at the base of the riser, as approved.

210013 SPRINKLER HEADS

A. Sprinkler head types shall be as indicated on the Contract Drawings, and shall be listed for the proposed application.

B. All sprinkler heads shall be quick response type, unless otherwise indicated on the Contract Drawings.

C. All sprinkler heads shall be glass bulb type.

D. Sprinkler heads shall have ordinary temperature classification, unless otherwise indicated on the Contract Drawings, or required by NFPA 13.

E. K-Factor of sprinkler heads shall be 5.6 or 8.0.

F. Provide spare sprinkler head cabinet with a spare sprinkler heads of each type installed within the building, as required by NFPA 13. Provide at least one wrench of each type required. Existing spare sprinkler head cabinet may be used, if there is enough space available within the cabinet .

210014 PROTECTION OF WORK AND EQUIPMENT

A. The Contractor shall be responsible for all work damaged by him or her. Any fire sprinkler system work damaged by any other contractor shall be replaced by the Contractor and placed in perfect working

condition without extra cost to the Owner. All sprinkler heads, valves, pipe, fittings, and equipment shall be adequately protected before, during and after installation.

B. The Contractor shall be responsible for all sprinkler heads, valves, pipe, fittings, and equipment at time of final inspection. Any broken items will be replaced by the Contractor at no cost to the owner regardless of by whom the item was broken.

210015 TESTING

A. The entire sprinkler system, including existing portions of the system to remain and the existing fire pump shall be tested and re-certified.

B. The Contractor shall notify the Engineer forty-eight (48) hours in advance of all tests. The Contractor shall make all necessary preliminary tests to ensure a functional system, which shall include flushing, testing, and inspection of sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter. The Contractor along with a factory-trained fire pump manufacturer's representative shall perform a preliminary test of the fire pump by operating the pump, performing flow testing to ensure that pump is operating at rated capacity, automatic start and automatic settings testing, sequence of operation check, alarm and supervisory signals check.

C. Fire pump tests shall be per NFPA 20.

D. All tests shall be applied before any work is concealed or covered in any manner.

E. All tests shall be conducted with regard to safety of all personnel on site.

F. The Authority Having Jurisdiction shall be alerted to and invited to witness all Division 21 tests.

G. Preliminary Tests:

1. All sprinkler piping, including fire pump suction and discharge piping, shall be made tight under a hydrostatic test pressure of 50 psi greater than the required design pressure, or 200 psi, whichever is greater. Hydrostatic test pressure shall be maintained without pressure loss for a minimum of two (2) hours. No caulking of joints will be permitted. Test pressure shall be read from a gauge located at the low elevation point of the system that is under test pressure. Any joint found to leak under this test shall be broken, remade and a new test applied.
2. Waterflow detecting devices, including associated alarm circuits, shall be flow tested using the inspector's test connection. Alarm bell must be audible on premises within five (5) minutes of fully opening inspector's test connection. Each water-operated alarm device shall be tested to verify proper operation.
3. The Electrical Contractor shall check all wiring to fire pump motor, jockey pump motor and associated controllers, prior to testing.
4. Fire Pump Testing shall be performed by a factory-trained representative of the fire pump manufacturer.
5. Flush fire pump suction and discharge piping at rate per NFPA 20. Flush piping for 10 minutes or until water appears to be clear, whichever is longer. Contractor shall submit a signed and dated flushing certificate before requesting field testing. Fire pump suction and discharge piping shall be flush prior to performing hydrostatic testing.
6. Each tamper switch shall be tested by operating the associated valve.
7. Following flushing of the underground piping, a main drain test shall be made to verify the adequacy of the water supply. Static and residual pressures shall be recorded and submitted. In addition, a main drain test shall be conducted each time after a main control valve is shut and opened.
8. Energize circuits to electrical equipment and devices.
9. Main drain valves shall be opened until the system pressure stabilizes.
10. All control valves shall be fully opened and closed under system water pressure to ensure proper operation.

11. All backflow preventers shall be tested and certified by an approved and licensed backflow prevention company.
12. All alarms, supervisory signals, and trouble signals that are related to the sprinkler system and/or fire pump system shall be activated and verified.

H. A final acceptance test shall be conducted, only after all above tests have been successfully conducted and reports have been submitted and approved, in which a technician employed by the installing Sprinkler Contractor shall provide a complete demonstration of the operation of the system. This demonstration shall include operation of control valves and flowing of inspector's test connections to verify operation of associated waterflow alarm switches, as well as a subsequent main drain test to verify that the control valves are in the open position. The technician shall have a copy of all "as-built" drawings, as well as certificates of previously conducted tests listed above. The sprinkler system installation shall not be considered accepted until as identified problems have been corrected, and the system is successfully retested. It is also required that the test documentation is properly completed and received prior to system acceptance.

I. Final acceptance test of the fire pump shall require the pump to operate at no-flow, 25%, 50%, 75% 100%, 125%, and 150% of rated flow, via the test header, for a minimum of 5 minutes each. Flow readings shall be taken at each flow rate. RPM, suction and discharge pressure, voltage and ampere readings shall be taken for each flow rate. The voltage at the motor contactor output lugs shall not vary less than 5% below or 10% above the rated voltage during the tests.

J. Fire pump controller shall be tested per manufacturer's instructions. At minimum, no fewer than six manual and 6 automatic operations shall be performed during final acceptance tests.

K. The Automatic Transfer Switch shall be tested by simulating a power outage of the primary power source.

L. Prior to making a request of Beneficial Occupancy the Sprinkler Contractor shall submit written test reports and certificates as required by NFPA 13, 20, and 24. Submittals shall include system acceptance forms copyrighted by NFPA which shall bear the NFPA copyright symbol. No other forms shall be considered.

M. Sprinkler piping system will be considered defective if it does not pass tests and inspections. Replace damaged and malfunctioning controls and equipment, and retest as necessary.

N. The Contractor shall furnish all necessary equipment, materials and labor to perform the above-specified tests. All equipment and materials shall be in excellent condition.

210016 PLACING IN SERVICE

A. The Contractor shall furnish Owner's representative with Contractor's Material and Test Certificate, per NFPA.

B. The 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.

210017 ELECTRICAL WIRING

A. Equipment connections to alarm systems shall be provided by Fire Alarm Contractor.

210018 OPERATING AND MAINTENANCE MANUAL

A. Four (4) complete sets of all operation and maintenance manuals **shall** be delivered by the Contractor to the Owner thru the Architect. The manuals **shall** be installed in 3-ring hard cover heavy duty notebooks with the name of the project and the words "**Operation and Maintenance Manual**" permanently affixed to the **cover** and **spine**. All items for the project shall be separated by identification tabs correlated to the index. The manuals **shall** contain the following items as a minimum:

1. Index and page number.
2. Certificate of substantial completion.
3. A summary sheet of warranties with dates noted and a copy of all warranties.
4. List of subcontractors and suppliers with names, addresses, and phone numbers.
5. Backflow preventer certificate of operation.
6. All documented results of preliminary and system acceptance testing.
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
8. Lubrication schedules and types of lubricants.
9. Complete set of Sprinkler Contractor's record drawings and hydraulic calculations.
10. Equipment summary showing all capacities and ratings (HP, KW, etc.).
11. Operation manuals, installation manuals, and parts list for all installed equipment.
12. All submittal data indexed with tabs.
13. Copy of NFPA 25, edition to match that which is currently enforced by the Authority Having Jurisdiction.

B. One copy shall be manufacturers original published literature with manufacturers name on all items. **FAXED COPIES WILL NOT BE ACCEPTABLE**.

C. Contractor shall provide training of Owner's maintenance personnel on the operation and maintenance of the sprinkler system.

210019 AS BUILT DRAWINGS

A. The General Contractor and Sprinkler Contractor, shall maintain "during the course of the work" a set of drawings marked up to show the work as installed. Both Contractors 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, Sprinkler Contractor shall use these as-built drawings to create a set of record drawings which shall be delivered to the Architect.

210020 GUARANTEE

A. Guarantee: The Contractor shall guarantee the entire fire sprinkler system subject to the General Conditions of these specifications.

210021 BIDDING PROCEDURE

A. The Contractor shall provide bidding for Alternate Bids in accordance with Division 1 of these specifications. Contractor shall refer to Division 1 for any required unit prices and allowances.

END OF SECTION 210000

SECTION 220000 – PLUMBING

220001 GENERAL

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

B. Contractor shall provide coordination drawings per Division 1.

C. Plumbing work shall be performed as outlined in “Information for Bidders”.

D. These specifications and the accompanying plumbing drawings are intended to provide for all labor, materials and equipment necessary for the installation complete of all

1. Plumbing Fixtures
2. Equipment
3. Rough-Ins
4. Waste and Vent System
5. Condensate Drainage System
6. Cold Water System
7. Hot Water System
8. Roof Drainage System
9. Overflow Roof Drainage System

and accessories including necessary apparatus, valves and fittings hereinafter described or called for on the plumbing drawings accompanying these specifications.

E. All plumbing work shall be installed in accordance with the following Codes and all Local Ordinances. Materials, equipment and workmanship shall be as hereinafter specified.

1. North Carolina State Plumbing Code
2. North Carolina State Fire Prevention Code
3. North Carolina Electrical Code
4. North Carolina Accessibility Code
5. NSF Standard # 61

F. This contractor shall secure all required permits and inspection fees necessary for this work. Permits may be secured from the Building Inspections Department.

G. The accompanying 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 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.

H. The Contractor shall coordinate water and sewer taps and pay all fees in conjunction to provide services as required, for this project.

220002 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 roof drainage leader system as shown on the plumbing drawings and here-in specified.
5. Furnish and install overflow roof drainage system as shown on the plumbing drawings and here-in specified.
6. Furnish and install condensate drainage system as shown on the plumbing drawings and here-in specified.
7. Provide connections to equipment furnished and installed by General Contractor or Owner as shown on the plumbing drawings and here-in specified.

220003 LIST OF MATERIALS, FIXTURES AND EQUIPMENT

A. The Plumbing Contractor shall obtain written approval from the Engineer/Architect for the use of substitute materials claimed as equal to those specified. Such approvals must be obtained as soon after contract awards as possible and before any materials are ordered. Applications for approvals shall be made by the Plumbing Contractor and not by subcontractors or manufacturer's representative. The Plumbing Contractor shall submit within ten days following award of contract and written notice to begin the work a complete list of materials proposed for the job. All like items shall be by the same manufacturer. When this list is approved, no further substitutions will be permitted except in unusual or extenuating circumstances. If no list is submitted, the Contractor shall supply materials specified. *Contractor should note that all items specified in section 220000 shall be submitted independently of other 220000 series sections.* The Plumbing Contractor shall review and stamp the submittals as being in accordance with his bid and these specifications. **Private labeled materials are not acceptable.**

B. The Plumbing Contractor shall submit shop drawings to the Architect after award of the contract, and before any materials, fixtures, and equipment to be incorporated in the work has been ordered. Shop drawings shall include the name and address of the manufacturer and their catalog numbers and trade names clearly marked. All items shall be referenced to the plans and specifications by **fixture designation or specification paragraph number on an index tab**. One complete set of submittal data shall be manufacturer's original published material. **FAXED COPIES WILL NOT BE ACCEPTABLE**. Approval of materials will be based upon the manufacturer's published ratings. Submit shop drawings and/or catalog data for the following material and equipment:

1. Waste Piping, Fittings and Couplings
2. Condensate Piping, Fittings and Couplings
3. Water Piping, Fittings and Equipment
4. Roof Drainage Piping, Fittings and Couplings
5. Overflow Roof Drainage Piping, Fittings and Couplings
6. Cleanouts and Access Doors
7. Valves
8. Insulation
9. Hangers
10. U. L. penetration systems
11. Pipe Markers
12. Fixtures
13. Coordination Drawings per Division 1.

C. Approval of shop drawings and/or submittal data 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. If data submitted deviates from the contract documents, the Plumbing Contractor shall point out such deviations in writing and also state reasons for same. All similar items shall insofar as possible be one make and manufacturer.

D. Where any special make, fixture or materials are specified by plate number, trademark or name, deliver to the building with original labels or other identification marks placed thereon by the manufacturer and

do not remove until inspected and approved by the Architect. Similar and equal materials and equipment by other manufacturers will be acceptable, subject to approval.

E. Failure to submit materials, equipment, fixtures, etc., in the time period specified above, the Architect shall assume that all items shall be installed as specified.

220004 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.

220005 WORKMANSHIP

A. Layout:

1. Drawings indicate general locations of fixtures. Secure exact location from Architectural plans before proceeding with work.
2. 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 general contractor shall result in the Contractor doing all cutting and repairing at his own expense.
3. Sleeves as here-in-after specified shall be installed on all through the floor piping above slab on grade except water closet rough-ins. Water closet rough-ins shall be cast in place. Core drilling of slabs shall be sealed with approved fire retardant caulking and sealed watertight.
4. All equipment shall be installed in accordance with manufacturer’s written installation instructions.

B. Drainage, Waste and Vent Piping:

1. Grade all sanitary waste lines 2" and smaller 1/4" per foot.
2. Grade all sanitary waste lines 3" and larger 1/4" per foot, where possible, 1/8" per foot minimum.
3. Grade all condensate drain lines 1/8" per foot.
4. All underground piping shall be graded by the use of a laser beam alignment system.
5. All floor drains shall be set ½ inch below the room finished floor perimeter and the entire floor sloped to the floor drain.
6. 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.
7. Provide removable caps for cleanouts with at least six threads engaged. Provide cleanouts at foot of waste and drainage stacks, all changes in direction of horizontal lines more than 135 degrees, in straight lines at intervals not exceeding 100-feet and anywhere additionally noted on the drawings.
8. Support horizontal cast iron soil pipe with a minimum of one hanger for each pipe length. Location close to hub or no-hub connector.
9. Run 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.
10. Tapped tees and crosses will not be permitted. Tapped sanitary tees and crosses shall be used.
11. No soil, waste, or vent piping shall be covered or concealed, until tested and approved by the Architect.
12. Conceal all soil and vent piping. 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.

C. Water System:

1. Conceal water supply piping in walls, below floor or above ceiling except where exposed for connections to fixtures. Install and secure all piping as walls are built. Wedging of piping will not be permitted. All piping shall be isolated from mortar.
2. All water piping shall be routed with a minimum clearance of ten (10) feet from any electrical switchboards, panel boards or telephone backboards.
3. Arrange all pipes to freely drain through a ball valve when water is cut off. All branch valves shall be installed adjacent to the water piping main.
4. All supplies to fixtures shall have individual stop valves.
5. Provide water hammer shock arrestors as required to prevent water hammer. Arresters shall be A.S.S.E. Standards Number 1010 certified. Arresters shall be installed in accordance with manufacturer's published recommendations. Air chambers are not acceptable. Water hammer shock arrestors shall be as manufactured by Precision Plumbing Products, Inc. or approved equal by Zurn, Josam, J.R. Smith, or Sioux Chief.
6. All exposed piping to fixtures shall be chrome plated installed true and plumb.
7. Insulate all water piping inside the building as hereinafter specified.
8. 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.
9. Extend water lines to water mains where shown on the plans.

D. Roof Drainage Piping:

1. Roof drains shall be provided by the Plumbing Contractor and installed where shown on the architectural roof plan by the General Contractor. The Plumbing Contractor shall connect to these roof drains and install the collector and leader system as shown on the plans.
2. Grade all horizontal leaders with slopes as shown on the drawings.

E. Overflow Roof Drainage System:

1. Overflow roof drains shall be provided by the Plumbing Contractor and installed where shown on the architectural roof plan by the General Contractor. The Plumbing Contractor shall connect to these roof drains and install the collector and leader system as shown on the plans.
2. Grade all horizontal piping with slopes as shown on the drawings.
3. Terminate piping discharge where shown on the drawings.

F. Insulation:

1. All pipe insulation joints shall be sealed to maintain integrity of the vapor jacket and shall pass thru all sleeves unbroken except for fire stops.
2. Pipe insulation at all fire separations shall be butted tightly to the firewall or to the floor after fire stop material has been installed.

220006 CUTTING, PATCHING AND CHASING

A. All cutting and patching shall be in accordance with the "General Conditions" of these specifications.

220007 EXCAVATION, TRENCHING AND BACKFILLING

A. 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.

B. 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.

C. 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.

D. 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.

E. The Contractor shall include in his bid for excavation 10 cubic yards of rock, computed at the unit price quoted by him/her.

F. 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.

G. The Architect/Engineer or his 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.

220008 SEISMIC RESTRAINTS

A. The Contractor shall be responsible for providing restraints to resist the earthquake effects on the plumbing system. The requirements for these restraints are found in Section 1613 of the North Carolina Building Code. All tables and references shall conform to the building’s location. Restraints shall be per Seismic Design Category C.

B. The Contractor shall refer to the latest edition of the “Seismic Restraints Manual Guidelines for Mechanical Systems” published by SMACNA for guidelines to determine the correct restraints for piping and conduit, etc. This manual refers to Seismic Hazard Level (SHL).

C. The anchorage of the equipment and machinery for this project shall be an integral part of the design and specification of such equipment and machinery. Manufacturers of all equipment including pumps, hot water heaters, tanks, etc. shall provide anchorage details, isolators, seismic mounts and restraints, etc. necessary to comply with Section 1613 to the Contractor for installation. It shall be the Contractor's responsibility to provide and install the equipment, machinery, systems, and assemblies, etc. For this project that satisfies these requirements.

D. Where seismic restraints are required, the Contractor shall provide restraints per details and instructions included in SMACNA's Seismic Restraints Manual. Contractor shall include shop drawings of the specific methods of seismic restraint to be used for this project before installation of piping and equipment.

E. The Contractor shall retain the services of a Professional Engineer registered in the State of North Carolina to design seismic restraint elements required for this project. The engineer's computations, bearing his professional seal, shall accompany shop drawings that show Code compliance. Computations and shop drawings shall be submitted for review prior to the purchasing of materials, equipment, systems and assemblies.

F. Internal seismic restraint elements of manufactured equipment shall be certified by a Professional Engineer retained by the manufacturer. Such certificate applies only to internal elements of the equipment. All equipment anchorage requirements shall be coordinated with the building structure and shall be compatible thereto. All such anchorage shall be reviewed by the project's structural engineer.

G. The Professional Engineer retained by the Contractor for seismic restraint calculations, shall visit the job site upon completion of the seismic restraint installation. This engineer shall provide in writing verification of compliance with the approved seismic submittal. This verification shall bear the Engineer's professional seal. Job site inspections by other than this engineer are not acceptable.

H. Review of the seismic design and shop drawings by the Engineer/Architect or his agent shall not relieve the Contractor of his responsibility to comply with the seismic or any other requirements of the North Carolina State Building Code.

220009 WASTE & VENT SYSTEMS

A. Piping:

1. Sanitary waste and vent piping 2" and larger below grade or slab on grade shall be service weight bell and plain end cast iron pipe conforming to ASTM A-74 and shall carry country of origin, manufacturer's name or manufacturer's registered trade-mark.
2. Sanitary waste and vent piping 2" and larger above the slab level shall be no-hub cast iron conforming to C.I.S.P.I. Standards 301 and shall carry country of origin, manufacturer's name or manufacturer's registered trade-mark.

B. Fittings:

1. Fittings for cast iron waste and vent piping shall be of the sanitary drainage pattern and conforming to piping specification and shall be marked with the Cast Iron Soil Pipe Institute symbol cast into the fitting.

C. Joints:

1. Joints for below slab on grade cast iron waste piping and vent piping shall be made up using Neoprene push joint gaskets conforming to ASTM C-564.
2. Joints for hubless cast iron piping shall be made using neoprene gasket and stainless steel clamping band conforming to C.I.S.P.I. Standards 310. Bands shall be same manufacturer as piping and shall carry the NSF Logo.
3. Flashing of plumbing vents will be provided by the General Contractor.

220010 CONDENSATE DRAINAGE

A. Piping:

1. Condensate drainage piping 2" and larger below grade or slab on grade shall be service weight bell and plain end cast iron pipe conforming to ASTM A-74 and shall carry country of origin, manufacturer's name or manufacturer's registered trade-mark.
2. Condensate drainage piping above slab on grade shall be no-hub cast iron conforming to C.I.S.P.I. Standards 301 and shall carry country of origin, manufacturer's name or manufacturer's registered trade-mark.

B. Fittings:

1. Fittings for condensate piping shall be of the sanitary drainage pattern and conforming to piping specification and shall be marked with the Cast Iron Soil Pipe Institute symbol cast into the fitting.

C. Joints:

1. Joints for below slab on grade piping shall be made up using Neoprene push joint gaskets conforming to F.S. 564-65T.
2. Joints for hubless cast iron piping shall be made using neoprene gasket and stainless steel clamping band conforming to C.I.S.P.I. Standards 310. Bands shall be same manufacturer as piping and shall carry the NSF Logo.

220011 HOT AND COLD WATER SYSTEMS

A. Water Piping:

1. Water piping 4" and smaller above grade inside the building shall be Type 'L' hard copper conforming to ASTM B-88.

B. Fittings:

1. Fittings for copper piping shall be wrought copper, solder joint fittings conforming to ANSI B 16.22.

C. Joints:

1. All copper piping joints, 1-1/4" and smaller shall be made using lead free solder with a minimum melting point of 410 degrees Fahrenheit.
2. All copper piping joints, 1-1/2" and larger shall be made using Phos-copper silver alloy material with a minimum melting point of 1000 degrees Fahrenheit.

D. Expansion Loops:

1. Expansion loops shall be lead-free carbon steel with stainless steel braid assembly and sweat ends.

220012 ROOF DRAINAGE SYSTEM

A. Piping:

1. Roof drain leaders above grade shall be hubless cast iron piping conforming to C.I.S.P.I. Standards 301 and shall carry country of origin, manufacturer's name or manufacturer's registered trade-mark.
2. Roof drain leaders below slab on grade shall be service weight bell and plain end cast iron soil pipe conforming to ASTM A-74 and shall carry country of origin, manufacturer's name or manufacturer's registered trade-mark.

B. Fittings:

1. Fittings for cast iron roof drain leaders shall be the sanitary drainage pattern cast iron conforming to ASTM A-74 and shall be marked with the Cast Iron Soil Pipe Institute symbol cast into the fitting.

C. Joints:

1. Joints for below slab on grade cast iron roof drainage piping shall be made up using Neoprene push joint gaskets conforming to ASTM C-564.
2. Joints for hubless cast iron piping shall be made using neoprene gasket and cast iron clamping band with stainless steel bolts torqued to manufacturer's specifications. Clamps shall be as manufactured by MG Piping Products Company or approved equal.

D. Drains:

1. Primary roof drains shall be large sump body coated cast iron drains with galvanized cast iron domes, adjustable extension, combination flashing device/gravel guard, static extension and top set deck plate. Drains shall be Zurn ZC-100-DP-E or approved equal by Josam, J. R Smith, Wade or Watts. Height of static extension shall be as shown on architectural drawings. No hub outlet shall be sized as shown on the drawings.

220013 OVERFLOW ROOF DRAINAGE SYSTEM

A. Piping:

1. Overflow roof drain leaders above grade shall be No hub cast iron piping conforming to C.I.S.P.I. Standards 301 and shall carry country of origin, manufacturer's name or manufacturer's registered trade-mark.

B. Fittings:

1. Fittings for cast iron overflow roof drain leaders shall be the sanitary drainage pattern conforming to ASTM A-74 and shall be marked with the Cast Iron Soil Pipe Institute symbol cast into the fitting.

C. Joints:

1. Joints for hubless cast iron piping shall be made using neoprene gasket and cast iron clamping band with stainless steel bolts torqued to manufacturer's specifications. Clamps shall be as manufactured by MG Piping Products Company or approved equal.

D. Termination:

1. Overflow roof drains shall terminate with a nickel bronze downspout nozzle. Downspout nozzle shall be provided with manufacturer's stainless steel screen. Screen shall be secured in place. Downspout nozzle shall be Zurn ZANB-SS series or approved equal by Josam or J. R. Smith.

E. Drains:

1. Overflow roof drains shall be large sump body coated cast iron drains with galvanized cast iron domes, adjustable extension, combination flashing device/gravel guard, static extension, internal water dam to provide not in excess of 4" height over main roof drain and top set deck plate. Drains shall be Zurn ZC-100-DP-E or approved equal by Josam, J. R Smith, Wade or Watts. Height of static extension shall be as shown on architectural drawings. No hub outlet shall be sized as shown on the drawings.

220014 CLEANOUTS AND ACCESS DOORS

A. Cleanouts shall be the same diameter as the pipe they are connected to. If the pipe is greater than 4" in diameter, the cleanout shall be 4".

B. Cleanouts installed in walls or pipe chases shall be installed using cast iron cleanout tee with cast bronze slotted plug, stainless steel cover with vandalproof securing screw. Cleanouts shall be Zurn ZS-1468, Josam 58600-PLG, or J. R. Smith 4472.

C. Cleanouts installed in floors and walks shall have adjustable cast iron body with cast brass plug, lead seal and round nickel bronze top with watertight gasketed cover. Cleanouts shall be Zurn ZN-1400, or approved equal by Josam or J. R. Smith.

D. Cleanouts installed above ceiling, where permitted by authority having jurisdiction, shall be a pipe cap installed using a no-hub band and clamp.

E. The Contractor shall provide access doors in accordance with Division 8. Access doors shall be provided for all valves and shock arrestors located behind hard ceilings and in walls to provide access to valves and/or equipment. Ceiling access doors shall be a minimum of 24" x 24".

220015 VALVES

A. Valves shall be installed at all points noted on the plans by standard symbols or as required by best general practice for proper control and operation of the system. All valves shall be identified with 1" diameter, 19 gauge, polished brass identification tags with a number and valve service indicated. Provide a valve chart listing all valves with size and service framed and mounted under glass in the main mechanical room. 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.

B. Check valves 2 inches and small shall be Class 125, lead free design cast bronze body with threaded ends.

C. Domestic cold and hot water system valves 1-1/4 inch and smaller shall be lead free design cast bronze body, full ported, soldered end ball valves rated for Class 150, 200 WOG service.

D. Domestic cold and hot water system valves 1-1/2 inch and 2 inch shall be lead free design cast bronze body, full ported, threaded end ball valves rated for Class 150, 200 WOG service. Valves shall be provided with stem extensions for insulation thickness specified.

E. Domestic cold and hot water system valves 2-1/2 inch and larger shall be flanged end, iron body ball valves rated for Class 150, 200 WOG service. Valves shall be provided with stem extensions for insulation thickness specified.

220016 PIPE INSULATION

A. All plumbing pipe insulation systems shall be installed as a subcontract to the Plumbing contract. All plumbing pipe insulation systems, including jacketing, coverings, adhesives when used, shall have a flame spread rating not exceeding twenty-five (25) and a smoke development rating not exceeding fifty (50) when the insulation assembly is tested as a composite. Fibrous glass pipe insulation shall be pre-molded with a thermal conductivity of 0.24BTU/in/hr/ft^2 at 100°F.

1. Insulate all cold water piping above grade with 1" thick pre-molded fibrous glass pipe insulation with self-sealing fire retardant vapor barrier jacket.
2. Insulate all hot water piping, 1-1/2" and smaller, above grade with 1" thick pre-molded fibrous glass pipe insulation with self-sealing fire retardant jacket.
3. Insulate all hot water piping, 2" and larger, above grade with 1-1/2" thick pre-molded fibrous glass pipe insulation with self-sealing fire retardant jacket.
4. Insulate all hot water return piping with 1" thick fibrous pre-molded glass pipe insulation with self-sealing fire retardant jacket.
5. All drain bodies receiving rain water shall be insulated with 1" thick insulating cement insulation.
6. All roof drain leaders, horizontal and vertical, above slab on grade shall be insulated with 1" thick pre-molded fibrous glass pipe insulation with self-sealing fire retardant vapor barrier jacket.
7. All overflow roof drain leaders, horizontal and vertical, above slab on grade shall be insulated with 1" thick pre-molded fibrous glass pipe insulation with self-sealing fire retardant vapor barrier jacket.
8. Rigid pipe insulation inserts shall be provided for all insulated piping 2" and larger.
9. All condensate drainage piping, horizontal and vertical, above slab on grade serving air conditioning condensate shall be insulated with 1" thick pre-molded fibrous glass pipe insulation with self-sealing fire retardant vapor barrier. Condensate P-traps shall be insulated with 1" thick insulating cement insulation.

B. Exposed pre-molded pipe insulation in finished areas and mechanical rooms shall be finished with factory jacket neatly pasted in place and left ready for painting as specified hereinafter.

C. All pipe insulation for pipe fittings shall be pre-molded to fit fittings and shall be enclosed under pre-molded PVC fitting jacket.

D. Plumbing piping located in CMU walls shall be insulated with closed cellular foam insulation with thicknesses as specified above. Foam insulation thermal properties shall match or exceed the specified thermal insulation properties for the intended usage. Insulation shall be secured with insulation manufacturer’s approved tape.

220017 HANGERS

A. Hangers for vertical piping shall be the Riser Clamp design and shall conform to MSS SP-58, Types 1 through 58.

B. Hangers for horizontal piping shall be the Clevis type and shall conform to MSS SP-58, Types 1 through 58.

C. **Hangers for insulated piping shall extend around the insulation.** Provide 16 gage galvanized steel insulation protection saddles 12" long at each hanger on all insulated lines. At the contractor’s option, hangers for insulated piping may be Michigan Hangers Model 4031 or 4041. 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.

D. Hangers shall be spaced per the NC State Plumbing Code in accordance with the piping material.

E. 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.

F. For piping 4” in diameter and larger, rigid support sway bracing shall be provided at changes in direction greater than 45 degrees.

G. 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.

H. Hangers SHALL NOT be fastened to joist bridging or roof deck.

I. 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.

J. 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.

K. Piping supported from the floor shall be supported using a base plate securely anchored to the floor and be equipped with a pipe riser. Riser shall be a minimum size of one inch. Horizontal piping above the floor shall be anchored and rest on a manufactured saddle. Piping shall be secured to each saddle as approved by the Engineer.

220018 PIPE SLEEVES, PLATES, ESCUTCHEONS, ETC.

A. Pipe sleeves shall be standard weight schedule 40 black steel above slab on grade or cast iron below slab on grade. All sleeves shall be equal to construction thickness except that pipe sleeves passing through floors, other than slab on grade, shall extend 3/4" above the finished floor. Pipe sleeve sizes shall be sized two pipe sizes larger than piping passing thru the sleeve.

B. Piping thru non-fire rated walls, floors above slab on grade or ceilings, piping passing through foundation walls, and piping installed below structural footings shall have sleeves installed concentric and centered on pipe. Ream all sleeves to prevent cutting of piping. The Contractor shall furnish shop drawings to the general contractor and the Architect showing location, dimensions, and sizes of holes required. Sleeves on piping passing through foundation walls shall extend 6” beyond wall footing on both sides. Sleeves on piping installed below structural footings shall extend beyond footing as indicated on contract drawings.

C. Install escutcheons snug against room finish on all exposed pipe passing through walls, floors above slab on grade or ceilings. Use cup type escutcheons at floors where sleeves extend above finished floors. Escutcheons shall be chrome plated steel with spring clip.

D. Sleeves for insulated piping shall be large enough to allow the insulation to pass thru sleeve unbroken.

E. 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.

F. 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. All openings through horizontal fire separations shall be protected by Metacaulk U.L. Systems or approved U.L. listed system by other manufacturers.

G. All openings through floors and vertical fire separations shall be protected by combination water seal and fire stops as manufactured by HoldRite, or approved equal by Proset, Metacaulk, or 3M.

220019 PLUMBING SYSTEM IDENTIFICATION

A. All piping in the building shall be identified by snap-on pipe markers or secured with two zip ties. Markers shall have ANSI colored letters at ANSI height on ANSI colored background with flow arrows and shall be located at 10' on center along pipeline, at each tee branch and at each floor/wall penetration, both sides. A pipe marker shall be located adjacent to each valve. Pipe identification markers shall comply with ANSI A13.1 and be Custom MS-790 as manufactured by Marketing Service Incorporated or approved equal Steton, Emed or DuraLabel. Stenciling of piping and/or insulation is not acceptable. Wording on markers shall be as follows where more stringent than ANSI Standards:

1. Cold Water
2. Hot Water
3. Hot Water Return
4. Waste
5. Vent
6. Condensate
7. Roof drain
8. Overflow roof drain

B. Engraved plastic laminate signs for listed plumbing equipment shall be 1/16 inch thick and be secured with self-tapping stainless steel screws. Plastic laminate face color shall be red for all emergency applications and black for all other uses. Background color shall be white. Signage for all equipment, etc., shall show equipment or service identification, capacity, final date of acceptance for equipment item and warranty information. Signage shall be provided for the following items:

1. Water Heaters

220020 PROTECTION OF WORK AND EQUIPMENT

A. It is imperative that waste and vent lines not be filled with concrete, concrete grindings, sand, gravel, or other foreign matter. Under no circumstances shall any line be left open while the Contractor’s workers are not on the job site.

B. Plug each opening of waste and vent lines the same day it is installed with test plug securely held in place.

C. All floor drains and hub drains shall be covered immediately after installation.

D. The Contractor shall be responsible for all work damaged by him/her. Any plumbing work damaged by any other contractor shall be replaced by the 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.

E. 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.

220021 TESTING

A. The Contractor shall notify the Engineer 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.

B. All tests shall be applied before any work is concealed or covered in any manner.

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 each floor system shall be tested under a minimum of a 10-foot head including roof vent terminal.

D. All water piping, hot and cold shall be made tight under a hydrostatic test pressure of 150-lbs. per square inch and maintained without pressure loss for a minimum of four (4) hours. No caulking of joints will be permitted. Any joint found to leak under this test shall be broken, remade and a new test applied.

E. The roof drain piping system shall be tested in the following manner: Plug pipe outlet and fill entire under floor system with water under a 10-foot head above finished floor and sustain a constant level for a minimum period of three (3) hours. All piping above the lowest floor level shall be tested from a test tee installed at that level with the entire system filled with water into drain body and sustain the constant level for a period of three (3) hours.

F. The overflow roof drainage piping system shall be tested in the following manner: Each joint in piping system shall be tested under a minimum of a 10-foot water column for a one hour period without loss of water.

G. The Contractor shall furnish all necessary equipment, materials and labor to perform the above-specified tests.

220022 STERILIZATION

A. All new water piping shall be charged with a chlorine solution containing not less than 50-ppm available chlorine. 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. The system shall then be drained and flushed to provide satisfactory potable water before final connection is made to the existing distribution system.

B. The Contractor shall contract with an independent Testing Laboratory for a certification letter that the system sterilization meets or exceed standards for potable water.

220023 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 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.

C. The Contractor shall flush all water piping prior to the connection of flush valves, mixing valves, and faucet aerators to provide a clean and operational water system.

D. The 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 of the flush valves furnished and installed on the project.

E. It is the Contractor's responsibility to turn over to the owner all fixtures and floor drains in a clean condition.

220024 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 General Contractor. All finished painting will be by the General Contractor with colors to match the surrounding areas.

220025 OPERATING AND MAINTENANCE MANUAL

A. All operation and maintenance manuals **shall** be delivered by the Contractor to the Owner thru the Architect. The manuals **shall** be installed in 3-ring hard cover heavy duty notebooks with the name of the project and the words "**Operation and Maintenance Manual**" permanently affixed to the **cover** and **spine**. All items for the project shall be separated by identification tabs correlated to the index. The manuals **shall** contain the following items as a minimum:

1. Index and page number.
2. Certificate of substantial completion.
3. A summary sheet of warranties with dates noted and a copy of all warranties.
4. List of subcontractors and suppliers with names, addresses, and phone numbers.
5. Water Line test data for sterilization.
6. Backflow preventer certificate of operation.
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
8. Lubrication schedules and types of lubricants.
9. Complete set of current shop drawings and equipment description showing all capacities and other operation conditions.
10. Equipment summary showing all capacities and ratings (HP, KW, etc.).
11. Operation manuals, installation manuals, and parts list for all installed equipment.
12. All submittal data indexed with tabs and shop drawings.

B. One copy shall be manufacturer's original published literature with manufacturer's name on all items. ***FAXED COPIES WILL NOT BE ACCEPTABLE***.

220026 AS BUILT DRAWINGS

A. The General Contractor and Plumbing Contractor, shall maintain "during the course of the work" a set of drawings marked up to show the work as installed, including dimensions to and elevations of buried work. Both Contractors 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.

220027 FIXTURES

A. All exposed piping and metal parts shall be chrome plated. Slip joints will not be permitted except on fixture side of trap. 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 flanges compatible to waste piping materials and verminproofed wax gaskets.

B. **MANUFACTURER'S MODEL NUMBERS ARE PROVIDED FOR GENERAL INFORMATION ONLY.** Description of product shall take precedence over model numbers.

C. All water closets shall flush properly when flushing with 25 PSIG at the flush valve.

D. All floors drains, shower drains, and mop receptors shall have a deep seal cast iron P-trap installed below floor as a separate item. Joint connection shall be compatible to piping system.

E. All floor-mounted water closets shall be set and grouted with white grout between floor and closet base.

F. All wall-hung fixtures shall be sealed between wall and fixture with white "G.E. Silicone Seal" caulking.

G. All counter mounted fixture rims shall be sealed with clear "G.E. Silicone Seal" caulking.

WC-1 WATER CLOSET: (Adult ADA) 16-1/2" high, floor mounted, vitreous china, elongated siphon jet water saver 1.28 GPF bowl with 1-1/2" top spud, china caps, American Standard No. 3461.001, or approved equal by Kohler, or Zurn. Flush valve with 1" screwdriver angle check stop, vandal resistant stop cap, ADA flush handle, vacuum breaker, 1" chrome plated wall supply cover pipe, chrome plated cast brass escutcheon with set screw, 1-1/2" chrome plated flush pipe, Sloan No. 111-1.28YK or approved equal by Zurn or American Standard. White moltex open front seat with concealed stainless steel check hinge, less cover, American Standard 5901.100, Church No. 9500CT, Centoco 1500CCSS Bemis 1955SSCT,or Benekee 527. Contractor should note flush valve rough-in height as shown on the drawings. Flush valve handle shall be roughed in and mounted to the wide side of the toilet stall.

WC-2 WATER CLOSET: (Adult Standard) Floor mounted, 15" high vitreous china, elongated siphon jet water saver 1.28 GPF bowl with 1-1/2" top spud, china caps, American Standard No. 3451.128, approved equal by Zurn or Kohler. Flush valve with 1" screwdriver angle check stop, vandal resistant stop cap, ADA flush handle, vacuum breaker, 1" chrome plated wall supply cover pipe, chrome plated cast brass escutcheon with set screw, 1-1/2" chrome plated flush pipe, Sloan No. 111-1.28YK or approved equal by Zurn or American Standard. White moltex open front seat with concealed stainless steel check hinge, less cover, American Standard 5901.100, Church No. 9500CT, Centoco 1500CCSS, Bemis 1955SSCT, or Benekee 527. Contractor should note flush valve rough-in height as shown on the drawings.

WC-3 PENAL WATER CLOSET/LAVATORY: (Adult ADA) 18" high, floor mounted, 14 gage, type 304 stainless steel, elongated 1.28 GPF bowl with integral contoured seat, pneumatic pushbutton activated flush, bottom outlet, gasketed waste connection, 42" ADA grab bar, combined with lavatory with penal bubbler, pneumatic pushbutton, Integral P-Trap, front access, Willoughby ECF-3696-FA-L-ON-BP-1.28-NV-PPB-PT-GWC-TWC4C-GB4296, or approved equal by Bradley or Acorn.

U-1 URINAL: (Adult ADA) Complete High Efficiency Urinal System with exposed manual flush valve with 3/4" screwdriver angle stop valve, vandal resistant stop cap, ADA handle, vacuum breaker, 3/4" chrome plated wall supply cover pipe, cast brass escutcheon with set screw, 3/4" chrome plated flush pipe, and wall hung, vitreous china, siphon jet urinal with 2" wall outlet, 3/4" top spud, wall hanger, designed to flush properly with .125 gallons of water or less shall be American Standard 6590.503, Sloan WEUS-1000.1001-0.13, or approved equal by Zurn. Chair carrier with chrome plated cap nuts, Zurn Z-1222, or approved equal by J.R. Smith or Watts. Lip shall be mounted at height as shown on the drawings.

L-1 LAVATORY: (Adult ADA) 20" by 18" acid resistant enameled cast iron with 4" center set punching, back ledge, wall hanger, front overflow shall be Commercial Enameling 553 or approved equal by Zurn or Kohler. Single lever, chrome plated, lead free supply faucet with 0.5 GPM vandal resistant aerator shall be Zurn Z7440-XL-FC, or approved equal by Chicago Faucets, Delta, or Moen. Thermostatic lead free mixing valve with locking set point, 3/8" inlet check stops, 3/8" outlet, shall be installed under the lavatory to supply 110 F tempered water to the faucet. Mixing valve shall conform to ASSE 1070 or CSA B125.3 and shall be Watts Model LFUSG-B or approved equal by Combraco or Heatguard. Chrome plated lead free angle stops with loose key handle and 1/2" chrome plated nipple to wall and escutcheon with set screw shall be McGuire or approved equal by Zurn or Brasscraft. Stainless steel braided flexible supplies shall be as manufactured by McGuire or approved equal by Brass Craft, Watts. Chrome plated cast brass strainer with open grid, overflow openings, cast brass locknut and 1-1/4" 17 gauge tailpiece shall be McGuire, Zurn, or Engineered Brass Company.

1-1/4" by 1-1/2" 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. 1-1/2" chrome plated nipple to wall with escutcheon and setscrew shall be McGuire, Zurn, or Engineered Brass Company. Chair carrier with floor anchor plate, upright supports, and bearing plate shall be Zurn Model Z-1224, J. R, Smith Model 0800 or approved equal by Watts. Lavatory shall be mounted at height as shown on the drawings. Lavatory supplies and trap shall be protected by A.D.A. approved premolded insulation assembly as manufactured by Truebro, McGuire or Mainline.

L-2 COUNTERTOP LAVATORY: Nominal 20-3/8" by 17-3/8" vitreous china drop in bowl with front overflow and unglazed rim with mounting hardware and 4" center set punching shall be American Standard No. 0476.028 or approved equal by Kohler, Crane or Commercial Enameling. Single lever, chrome plated, lead free supply faucet with 0.5 GPM vandal resistant aerator shall be Zurn Z7440-XL-FC, or approved equal by Chicago Faucets, Delta, or Moen. Thermostatic lead free mixing valve with locking set point, 3/8" inlet check stops, 3/8" outlet, shall be installed under the lavatory to supply 110 F tempered water to the faucet. Mixing valve shall conform to ASSE 1070 or CSA B125.3 and shall be Watts Model LFUSG-B or approved equal by Combraco or Heatguard. Chrome plated lead free angle stops with loose key handle and 1/2" chrome plated nipple to wall and escutcheon with set screw shall be McGuire or approved equal by Zurn or Brasscraft. Stainless steel braided flexible supplies shall be as manufactured by McGuire or approved equal by Brass Craft, Watts. Chrome plated cast brass strainer with open grid, overflow openings, cast brass locknut and 1-1/4" 17 gauge tailpiece shall be McGuire, Zurn, or Engineered Brass Company. 1-1/4" by 1-1/2" 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. 1-1/2" chrome plated nipple to wall with escutcheon and setscrew shall be McGuire, Zurn, or Engineered Brass Company. Lavatory supplies and trap shall be protected by A.D.A. approved premolded insulation assembly as manufactured by Truebro, McGuire or Mainline.

SH-1 SHOWER: (Adult ADA) ADA shower stall will be constructed by the General Contractor. Shower drain with cast iron body, 2" hub outlet, 5" square nickel bronze heelproof top, vandal resistant securing screws, Zurn ZN-415S-VP-Y, or approved equal by Josam or J. R. Smith. Complete shower valve and shower head package shall include single-handle, pressure-balance, chrome-plated bronze shower valve with hot and cold water indicators, check stops set to 110F, integral thermometer, chrome-plated bronze diverter valve, chrome-plated, 2.0 gpm, fixed spray pattern shower head with arm, and 1.5 gpm fixed spray pattern hand spray, vacuum breaker, 60" braided stainless steel flexible hose, 24" glide rail, supply elbow and flange. Package shall be Bradley 1C-EFT1-ES1-ES-NONE-NONE-B24-DV-NONE-NONE-NONE-NONE or approved equal by Symmons or Delta. Showerheads and controls shall be mounted as shown on the drawings.

EWC-1 ELECTRIC WATER COOLER: (Dual Height) Wall mounted, dual height, vandal resistant, air cooled type water cooler with matching drinking fountain with stainless steel anti-splash receptor, stainless steel cabinet, in line 'Y' strainer, anti-squirt dual stream bubbler, automatic stream regulator, push controls on front, wall hangers, sealed hermetic compressor with capacity of 8-GPH of 50 ºF drinking water at 90ºF. room temperature and 80ºF. inlet water temperature, Elkay VRCGRNTL8C, or approved equal by Halsey Taylor, or OASIS factory wired for 115 volt, single phase electrical service. Chair carrier with steel upright support legs, backing plates shall be Zurn Z-1225, or approved equal by J.R. Smith or Watts. The Plumbing Contractor shall furnish the electrical receptacle rough-in dimensions to the Electrical Contractor to provide for a concealed electrical service to the unit. Plumbing Contractor shall provide PVC P-trap the same size as the electric water cooler drain. Wheel handle lead free stop valve shall be McGuire LF175 or approved equal by Zurn or Watts. Plumbing Contractor should note that spout shall be set at height as shown on the drawings.

EWC-2 ELECTRIC WATER COOLER: (Dual Height) Wall mounted, dual height, vandal resistant, air cooled type cooler with stainless steel anti-splash receptor, stainless steel cabinet, in line 'Y' strainer, anti-squirt dual stream bubbler, automatic stream regulator, push controls on

front, hands free bottle water filler, wall hanger, sealed hermetic compressor with capacity of 8-GPH of 50ºF drinking water at 90ºF room temperature and 80º F inlet water temperature, Elkay LVRCGRNTL8WSK, Halsey Taylor HTHB-HAC8BLWF, or Oasis PF8SBFSL, factory wired for 115 volt, single phase electrical service. Chair carrier with steel upright support legs, backing plates shall be Zurn Z-1225, or approved equal by J.R. Smith or Watts. The Plumbing Contractor shall furnish the electrical receptacle rough-in dimensions to the Electrical Contractor to provide for a concealed electrical service to the unit. Plumbing Contractor shall provide PVC P-trap the same size as the electric water cooler drain. Wheel handle lead free stop valve shall be McGuire LF175 or approved equal. Plumbing Contractor should note that spout should be set at height as shown on the drawings.

SK-1 BREAK ROOM SINK: (ADA) 22" x 19" x 5-1/2" deep single compartment, self rimming, 18-gauge, type 304 nickel bearing stainless steel with backledge, sound deadening applied to under side, rear center drain outlet shall be Elkay LRAD2219-5.5 or approved equal by Just or Advance Tabco. 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. Lead-free hot and cold water supply faucet with renewable cartridge, swing spout, 1.5 GPM soft flow aerator, less spray, shall be Chicago 1100-E35ABCP, Zurn Z871G2-XL-18F, or approved equal by Delta. Thermostatic lead free mixing valve with locking set point, 1/2” inlet check stops, 1/2” outlet, shall be installed under the sink to supply 120 F tempered water to the faucet. Mixing valve shall be ASSE 1017 approved and shall be Watts Model LF1170-US-M2 or approved equal by Combraco or Heatguard. A bronze lead free body strainer with stainless steel strainer shall be installed between the stop and the mixing valve. 1/2” sweat x 1/2” compression sink supply stops shall be equipped with 5” extension, wheel handle ball valve angle stops shall be McGuire, Zurn, or Brasscraft. 1-1/2” x 1-1/2" chrome plated adjustable cast brass P-trap with 1-1/2" slip joint inlet, cleanout, and 1-1/2" 17-gauge tube outlet shall be McGuire, Zurn, or Kohler. Install cast brass escutcheons with setscrew on all piping entering base cabinet. Supplies and trap shall be protected by A.D.A. approved premolded insulation assembly as manufactured by Truebro, McGuire or Mainline.

MR-1 MOP RECEPTOR: 24" x 24" x 10" deep molded stone receptor with 3" inside caulked drain, stainless steel strainer, Fiat Model MSB-2424, Williams Model MTB 2424 or Mustee Model 63. Wall mounted, polished chrome plated supply faucet with top brace, vacuum breaker, integral screwdriver shank check stops, 3/4" hose end, T&S B-0665-BSTP or approved equal by Chicago Faucets or Moen. Heavy duty, cloth reinforced rubber hose and hose hook, Fiat Model 832-AA, Williams Model T-35, or Mustee Model 65.700. Wall mounted, 24" long, 3 mop spring clip hanger, Fiat Model 889-CC, Williams Model T-40, or Mustee Model 65.600. Stainless steel wall guards with corner bracket shall be Fiat Model MSG 2424 or approved equal Williams, or Mustee 67.2424. Supply faucet outlet shall be mounted 24" above receptor floor. Contractor should note that joint between receptor, wall and floor should be sealed with clear silicone sealant.

CB-1 ICE MAKER CONNECTION BOX: Fully recessed unit with lead free cold water shut-off valve, compression nut and ferrule as shall be LSP Products Group model OB-801, IPS Corporation model AB9700 or approved equal Oatey Company.

HB-1 HOSE BIBB: Wall mounted, polished chrome plated brass with 3/4" vacuum breaker hose end, locking shield, tee handle, 1/2" inlet wall flange, Woodford Model 26P-1/2, Mifab MHY-9240, T & S Brass B-0702/B-972 or Preir C-257CP.75.

HB-2 HOSE BIBB IN BOX: Rough brass hose bibb with wheel handle, 3/4" vacuum breaker outlet, 1/2" inlet, cast brass or 304 stainless steel wall box, hinged door, loose key door lock, chrome plated or stainless steel exposed finish, Woodford Model B26-1/2-CH, Mifab MHY-95-49 or Metcraft Model 182.

HB-3 WALL HYDRANT: Non-freeze type with 3/4" copper inlet, 3/4" vacuum breaker or double check hose end, removable key handle, self draining, for wall thickness as required, Woodford Model 6, Zurn Model Z-1310 or Josam Model 71050-12.

FD-1 FLOOR DRAIN: Cast iron body drain with 4" outlet to match piping system, 6" square nickel bronze heelproof top, vandal resistant securing screws with flashing device, Zurn ZN415S-VP, or approved equal by Josam, J. R. Smith, Wade, or Watts.

FD-1 FLOOR DRAIN: Cast iron body drain with 2" outlet to match piping system, 6" square nickel bronze heelproof top, vandal resistant securing screws with flashing device, Zurn ZN415S-VP, or approved equal by Josam, J. R. Smith, Wade, or Watts

HD-1 HUB DRAIN: Provide 3" I.D. cast iron hub drain for condensate collection from HVAC equipment. Hub drain shall have p-trap below slab and shall extend to 1" above finished floor. Pipe material shall be per condensate drainage section of these specifications. Support shall be per hangers section of these specifications.

WH-1 WATER HEATER: Factory assembled electric 150-gallon storage type heater shall have ASME rated pressure vessel rated for 150 psi, factory installed insulation, ASME pressure and temperature relief valve, tank drain with hose connection, 16 gauge enameled steel jacket on structural steel base, three bolt-in, 10,000-watt immersion elements set to run simultaneously (30 kw total) and control box. Heater shall be controlled by immersed bulb thermostat and be equipped with high limit temperature control, control box, transformer, contactors and junction box. Control circuits shall be a maximum of 120-volts. Heaters shall be ASME constructed and labeled. Heaters shall be U.L. approved and shall carry 3-year factory warranty. Heater shall be factory wired for 480-volt, three-phase electrical service as shown on the plans and shall be Precision Boilers HWS-3054V-30A-408-150-PS, or approved equal by Lochinvar or PVI. Water heater shall be started by the manufacturer's factory representative.

220028 GUARANTEE

A. Guarantee: The Contractor shall guarantee the entire plumbing system subject to the General Conditions of these specifications.

220029 BIDDING PROCEDURE

A. The Contractor shall provide bidding for Alternate Bids in accordance with Division 1. Contractor shall refer to Division 1 for any required unit prices and allowances.

END OF SECTION 220000

SECTION 230500 - HEATING AND AIR CONDITIONING

230501 GENERAL

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

B. The Heating and Air Conditioning 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.

C. See Section 013100 for requirements for Coordination Drawings.

D. The Heating and Air Conditioning 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 North Carolina State Boiler Inspection Law Rules and Regulations and the North Carolina State Building Code. Codes to be a part of these specifications: North Carolina State Building Code, National Fire Protection Association Codes Section 70, 90A, 91 and other applicable sections.

E. Inspection by local authorities will be required.

F. 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 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 Heating and Air Conditioning 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.

G. Equipment and Materials shall be delivered to the site and stored in original containers, suitably sheltered from the elements, but readily accessible for inspection by the Engineer until installed. All items subject to moisture damage shall be stored in dry spaces.

H. 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 Heating and Air Conditioning Contractor shall not scale mechanical plans, but rather refer to architectural plans for dimensions.

I. By signing the Contractor’s Proposal, it is understood and agreed that the Heating and Air Conditioning Contractor has, by careful examination, satisfied himself with the quantity, quality, and location of all excavation materials to be encountered in his contract. No additional payment will be approved for well pointing or any other existing conditions encountered. Refer to Division 31 for site work requirements.

J. All debris resulting from heating and air conditioning work shall be removed from the premises daily or as directed by the 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 Engineer.

K. Guards shall be provided for all moving equipment, motor couplings, pump shafts, belt drives and similar exposed reciprocating or rotating components.

L. All HVAC and refrigeration equipment shall be labeled in accordance with Section 301 of the North Carolina Mechanical Code and as required by the Authority having jurisdiction. Labeling shall be a permanent factory-applied nameplate affixed to the equipment on which shall appear in legible lettering, the manufacturer’s name or trademark, the model, serial number, and the seal or mark of the testing agency.

230502 SCOPE

A. The Heating and Air Conditioning 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.

230503 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 is 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.

230504 SHOP DRAWINGS AND SUBMITTAL DATA

A. The Heating and Air Conditioning Contractor shall submit within 10 days after award of the contract a list of materials and the manufacturer to be used on this project. He shall submit within thirty days after award of the contract at least five copies of submittal data in written form for the Engineer’s use in approving materials and equipment. One copy will be returned. If the Heating and Air Conditioning Contractor desires the return of more than one copy, additional copies shall be provided to the Engineer at the time of the original submission. 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 Heating and Air Conditioning Contractor shall submit five 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 following equipment items:

1. Air Handling Units
2. VAV Terminal Boxes
3. Ductless Split System Heat Pumps
4. Split System Condensing Units
5. Chillers and Sound Attenuation
6. Power Ventilators
7. Diffusers, Grilles, and Registers
8. Expansion Tanks
9. Pumps and Suction Diffusers
10. Air Separators
11. Valves
12. Heaters

13. Controls with Complete Diagram
14. Water Treatment and Feeder System
15. Heat Trace Cable
16. Fire, Manual, and Motorized Dampers
17. Access Doors
18. Insulation
19. Vibration Isolation
20. Through-Penetration Firestop Details
21. Testing and Balancing
22. Coordination Drawings per Section 013100

230505 APPROVED EQUAL EQUIPMENT, ETC.

A. Manufacturers listed are to establish a standard of quality and not intended to limit the selection to these manufacturers. 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. It should be understood that where the word “provide” is used, it is intended that the Heating and Air Conditioning Contractor shall purchase and install all materials required. 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 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 Heating and Air Conditioning Contractor.

230506 AIR HANDLING UNITS

A. Units shall be draw through built-up central station and shall have their fan and coil performance certified in accordance with ARI Standard 430-89 for fans, ARI Standard 260 or AMCA 300 for sound, and 410-87 for coils. The unit shall be double wall with solid inner panels and no through metal, internal thermal break. Insulation between panels shall have minimum R value equal to 13.0. All insulation in the unit shall meet NFPA-90A flame spread and smoke generation requirements. All units shall be shipped and stored stretch-wrapped for protection. Units shall be listed and labeled by a nationally recognized independent testing agency. The units shall be Trane, Carrier, Daikin/McQuay, or JCI/York.

B. Unit shall be modular constructed of sections made of frame with removable panels. All sections shall be bolted and gasketed together. Entire assembled unit shall be on 8" base rails.

C. Access doors shall be same construction as unit casing with full perimeter gasketing. Doors shall open against air pressure differential. Doors shall be hinged and removable with interchangeable hinges and door handles. Door handles shall be cam locking. Provide multiple door handles at each latching point.

D. Coil pipe connections shall be on side of air handling unit opposite from fan and filter access doors.

E. Condensate drain pan shall be positively sloped double wall construction and shall be insulated with foam cement between the stainless steel outer pan and the stainless steel inner pan. Provide intermediate drain pan with downspouts in units with stacked coils.

F. Cooling coils shall be air tested at 300 PSIG, cartridge type, removable from coil connection side of casing and supported in tracks over the entire length of the coil. Fins shall be ripple-corrugated aluminum mechanically bonded to staggered copper tubes. Coil frames and casings shall be galvanized steel. See Air Handling Unit Schedule on drawings for coil positions. Extend coil air vents through unit’s outer casing.

G. Heating coils shall be UL-listed electric heater factory-installed in the air handler. Heater shall be open-coil configuration with Type A wire (80% nickel and 20% chromium) derated to a maximum watt density of 45 watts per square inch. Safeties shall include three-pole, disconnecting-type contactors, airflow switches, automatic-reset functional limits, automatic-reset high-temperature limits, and manual-reset

high-temperature limits. Heaters shall be factory-wired including control power transformer to accommodate SSR-full modulating control. SSR control shall receive a 0-10VDC or 4-20mA signal from the Building Automation System to provide full modulating control of the heater. Electric heaters above 48 amps shall be fused into circuits not to exceed 48 amps as required by UL and NEC. Kilowatt output shall be selected to the nearest 0.1 kW of scheduled kilowatt. See Air Handling Unit Schedule on drawings for coil positions.

H. Fan sections shall be plenum or fan array type. Fans shall be single width, single inlet plenum type with high efficient air foil blades. Fans shall be direct driven. Fan wheels shall be aluminum. Hp characteristic of the fans shall be non-overloading. Fans shall be provided with discharge screens to ensure protection from moving fan parts and inlet collars. Fans and fan arrays shall be controlled using a common control signal to modulate fan speed. A fan curve shall be provided for each bank of fans showing the performance of the entire bank of fans at design conditions. In addition, a fan curve shall be provided for each bank of fans showing the performance of the individual fans in the bank at design conditions. Finally, a fan curve shall be provided for each bank of fans showing the performance of the bank when one fan is down. The percent redundancy of each bank of fans with one fan down shall be noted on the fan curve or in the tabulated fan data.

I. Motors shall be EISA 2007 NEMA premium efficiency inverter duty squirrel cage, drip proof with 1.15 service factor and shall be Model J ball bearing with minimum NEMA MG 1, Part 31, design “B” for 40°C ambient. Efficiency rating shall be stamped on motor nameplate. Motor shall be internally mounted on adjustable base on isolated fan assembly. Isolators shall have minimum 1” static deflection. All handling units with external spring vibration isolators shall have internal spring vibration isolators locked down prior to operation. Fan assembly shall be isolated from the unit casing by flexible discharge duct connection and spring isolators. Motor starter shall have auxiliary contact, 120 volt holding coil and thermal overload protection on all three phases. Motor leads shall be extended to external casing mounted factory installed NEMA 4 external junction box within flexible metal conduit. Access to the motor and drive shall be provided by a hinged access door with cam lock latches located on the drive side of the unit and of adequate size to permit removal of the fan wheel, motor and drive. Bearings shall be self-aligning, pillow block regreasable ball types with grease line extending to fan support bracket on the drive side of fan. Fan wheels and shafts shall be statically and dynamically balanced as an assembly. After final assembly, the entire unit shall be given final vibration test. Motors for dual fans or fan arrays shall each have an independent overload and an independent ground connection.

J. All fans shall have variable frequency drive to provide full fan modulation. Drive shall be mounted on Mechanical Room wall. On motors greater than 10 HP with drives, provide shaft grounding rings. For dual fan or fan array application, motors shall be connected to a single VFD. **Drives and control wiring between DDC system and the drives shall be by the BAS Contractor.**

K. Air handling unit dampers shall be double-skin airfoil opposed blade type with metal compressible jamb seals and extruded vinyl blade edge seals with a maximum leakage rate of 4 cfm/sf at one inch water gauge when tested in accordance with AMCA Standard 500-D. Provide multiple dampers per position as necessary to achieve proper air control with sizing per ASHRAE Guideline 16-2014. See control diagrams on drawings for additional information.

L. Airflow measurement stations are built in to the fan inlet shroud. Additional AFMS where indicated shall be by the BAS contractor and as specified in Section 230900 2.7.I.

M. Sections with filters shall have hinged access doors with cam lock latches on both sides for filter replacement. No tools shall be required for access or filter removal. Air filters shall be 4" UL Class 1 pleated panels with Minimum Efficiency Reporting Value of MERV 8 per ASHRAE Standard 52.2-1999. Contractor shall supply 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 at the school for the next change. Filters shall have a face velocity not to exceed 500 feet per minute. Provide factory supplied fixed filter blockoffs to prevent air bypass around filters.

230507 VAV TERMINAL BOXES

A. The VAV terminal boxes shall be UL listed pressure independent variable air volume type with VAV cold duct complete with electric factory mounted DDC volume regulators, heavy gauge casing, control dampers, and electric heating coils. The boxes shall be Trane, Metal Aire, Enviro-Tec, Price, JCI/York, Krueger, or approved equal.

B. The unit casings shall be constructed of 22-gauge galvanized steel with removable bottom access panel. Casings shall be provided with four hanger brackets for threaded rod support.

C. Insulation of terminal units shall be 1" thick, 1.5 lbs. density, R-4.1 fiberglass with foil face and no exposed or raw edges. The surface of the insulation shall be treated to prevent erosion and shall conform to UL Test 181 for erosion and mold growth. The insulation shall be UL approved and meet NFPA 90A requirements.

D. DDC actuator for damper shall be installed by the terminal unit's manufacturer but furnished by the control manufacturer and shall be specifically designed for use with the unit. The actuators shall be field serviceable with replaceable internal parts. Coil control valves and actuators shall be field installed.

E. The control dampers shall be specifically designed to provide linear control characteristics throughout its operating range. An external indication of the damper blade position shall be provided. Total leakage of casing and dampers shall not exceed 5% at 3" inlet static pressure. Damper assembly shall be complete with integral flow sensor regardless of control type. Flow sensor shall be a multi-point, averaging, ring or cross type to be furnished and mounted by terminal unit manufacturer. Bar or single point sensing type is not acceptable. Flow sensing device shall be capable of maintaining airflow to within +/- 5% of rated unit airflow setpoint. Sensor shall communicate terminal box inlet cfm to BAS system.

F. Heating Coils:

1. Electric heating coils shall be factory mounted on the discharge of the unit's casing with capacities and stages as shown in the schedule. Coils shall be UL listed with SCR controls, safety cutouts, and airflow switch. Access door shall be provided to clean coil surface on upstream side of the coil. Coil shall be externally insulated as specified for ductwork.

G. Terminals shall have a maximum NC level of 25 in the space when using modeling assumptions for room and duct effect based on ARI 885-90. The NC level shall be based on a static pressure of two inches at the entrance of the box.

230508 DUCTLESS SPLIT SYSTEM HEAT PUMPS

A. Indoor section shall be vertical wall, ceiling cassette, or ceiling mounted ductless type split heat pump unit. Unit cabinet shall be 20 gauge-galvanized steel with rounded corners and finished with an undercoat and topcoat of hard finish polyurethane paint. Unit shall be internally insulated and be furnished with auxiliary heater and 1" thick pre-cut washable polyester filter media. Contractor shall supply sets of filters to protect equipment during construction, another change of filters at final completion, and leave an additional complete set of pre-cut filters at the building for the next change. Unit fan shall be dual tangential blower type. Unit shall have hardwired wall-mount temperature controller with high-medium-low fan control. Include condensate pump where not able to relieve condensate by gravity flow. High condensate limit switch shall deenergize unit if condensate pump fails to function.

B. Outdoor section shall be by the same manufacturer as the indoor section. Units shall be compact low profile type with inverter driven compressor, R410A refrigerant, crankcase heaters, and controls for low ambient temperature operation in cooling mode down to 0°F. The fans shall be permanently lubricated, direct drive, side discharge type. Safety controls shall include loss of charge and low and high pressure switch.

C. See Article 230542 GUARANTEE for description of compressor warranty requirements.

D. Refrigerant piping systems shall be sized, pitched, and furnished with all specialties as recommended by the unit manufacturer to accommodate refrigerant piping lengths. Specialties shall include suction line accumulators, liquid line solenoid valves, thermal expansion valves, refrigerant sight glass, removable core filter drier, and any other item deemed necessary or recommended by the unit manufacturer.

E. Units shall be UL or ETL labeled and shall be Daikin, Mitsubishi, Trane, Sanyo, Friedrich, LG, or approved equal.

230509 SPLIT SYSTEM CONDENSING UNITS

A. Condensing unit shall be split system air conditioning type connected to existing DX coil in existing air handling unit. Unit manufacturer shall be as necessary to achieve full functionality with existing coil.

B. Outdoor section shall be UL labeled and bear the AHRI seal. The fans shall be permanently lubricated, direct drive, propeller type. The compressors shall be hermetic using R-410A refrigerant with suction and discharge stop valves, crankcase heaters, automatically reversible oil pump, oil filter, internal thermostat, and controls for low ambient temperature operation. The unit controls shall include compressor staging, a high and low pressurestat of the automatic reset type, a positive acting five minute timer to prevent short cycling and a motor starting and protecting equipment. Units shall be furnished with coil guards.

C. See Article 230542 GUARANTEE for description of compressor warranty requirements.

D. Refrigerant piping systems shall be sized, pitched, and furnished with all specialties as recommended by the unit manufacturer to accommodate refrigerant piping lengths. Specialties shall include suction line accumulators, liquid line solenoid valves, thermal expansion valves, refrigerant sight glass, removable core filter drier, and any other item deemed necessary or recommended by the unit manufacturer.

230510 CHILLERS AND SOUND ATTENUATION

A. Heating and Air Conditioning Contractor shall furnish and install chillers as shown and scheduled on the drawings and hereinafter specified. Units shall produce the specified tonnages per the scheduled data in accordance with AHRI Standard 550/590-2003. Units shall bear the AHRI certification label as applicable and shall conform to AHRI Standard 550/590-2003 and UL 1995.

B. Chillers shall be factory pressure tested, evacuated and fully charged with HFC-134a refrigerant and oil. Functional test to verify correct operation by cycling condenser fans, closing compressor contacts and reading data points from temperature and pressure sensors shall be performed at the factory.

C. Provide complete parts and labor warranty for each entire chiller for one year. Refrigeration compressors in each chiller shall have five year parts warranty. Extended warranty shall include refrigerant also. Labor, freight, and any other required parts during compressor warranty years two through five shall be provided or paid for by the Owner.

D. Chiller Sound Requirements:

1. Chiller maximum sound pressure shall be 73 dBA with both chillers operating at full capacity and 70 dBA with one chiller operating at full capacity and the other chiller off. Sound pressure values shall be as measured at 30’-0” horizontal distance from the chiller to the receiver. Sound data shall be as factory tested in accordance with AHRI Standard 370-2015 and shall not be exceeded. If either chiller fails to achieve the specified sound data, the necessary sound attenuation systems for that chiller(s) and its surroundings shall be provided, including any expenses for chiller sound retesting.
2. Sound attenuation systems may include, but not be limited to, heavy duty oil and water resistant flexible type removable sound cover wraps for compressors, refrigerant piping, etc., mufflers on each compressor, and low noise condenser fans. Sound/acoustical calculations and data for sound attenuation system shall be included with chiller and sound attenuation submittal.
3. All chillers shall be included in the sound/acoustical evaluation. Sound attenuation system shall result in no degradation of chiller performance. Compliance with the specified sound requirements

is solely the responsibility of the chiller manufacturer/vendor and their sound attenuation system subcontractor.

E. Approved manufacturers:

1. JCI/York
2. Daikin/McQuay
3. Carrier
4. Trane

F. Chiller #1 and Chiller #2:

1. Provide complete factory assembled, single-piece chassis, air cooled type chillers with rotary screw compressors as shown and scheduled on the drawings. Contained within the package shall be all factory wiring, piping, controls, refrigerant charge (HFC-134a), and all customary auxiliaries deemed necessary by manufacturer for safe and automatic operation of the chillers.

G. Chillers shall be constructed of hot-dipped galvanized steel frame, panels, and access doors. Protective louvers shall be mounted over condenser fans, condenser coils, and compressor access areas for protection. Component surfaces shall be finished with a powder-coated paint. The coating or paint system shall withstand a 1000-consecutive-hour salt spray application in accordance with standard ASTMB117.

H. Each chiller shall have a minimum of two independent refrigerant circuits with one compressor on each circuit to provide multiple step capacity control. Compressors shall be semi-hermetic, variable speed drive, helical rotary screw type fully charged with HFC-134a refrigerant and oil. Motor shall be direct drive cooled by suction gas with automatic capacity reduction equipment consisting of capacity control via variable speed drive and/or slide valve. Compressor shall start unloaded for soft start on motors. Motors shall have one solid-state sensor imbedded in each motor winding to protect against excessive winding temperature. Chiller shall be capable of operation down to 25% load without hot gas bypass. Each refrigeration circuit shall include:

1. Liquid line shutoff valve
2. Suction service valve
3. Discharge service valve
4. Filter (replaceable core type)
5. Liquid line sight glass.
6. Electronic expansion valve sized for maximum operating pressure
7. Charging valve
8. Discharge and oil line check valves
9. High side pressure relief valve
10. Integrated oil loss sensor
11. Crankcase heater
12. Oil management system with reversible oil pump, oil level sight glass, oil charging valve
13. Elastomeric or Neoprene isolators, not pads.

I. Evaporator shall be shell and tube type evaporator, seamless or welded steel construction with cast iron or fabricated steel heads, seamless internally and externally finned copper tubes, roller expanded into tube sheets. Evaporator tubes shall be cleanable and removable from the heat exchanger. Chiller assembly shall be designed, tested, and stamped in accordance with ASME code for a refrigerant side working pressure of 200 PSIG and waterside working pressure of 150 PSIG. Evaporator shall be insulated and include a drain connection and connections for chilled water inlet and outlet. Water strainer with blowdown valve shall be factory provided for each chiller and installed in accordance with chiller's installation instructions. Factory provided flow switch for each chiller shall be IFM flow monitor type and installed the correct number of pipe diameters from any elbow and in the correct orientation. Heater tapes with thermostatic control shall be provided on the shell and all internal unit water piping to protect components from freeze-up down to -20°F ambient temperatures.

J. Condenser shall be coils consisting of aluminum fins mechanically bonded to seamless copper tubes complete with a subcooler circuit with liquid accumulator. Condenser and subcooler coils shall be tested

at 350 PSIG air pressure. Vertical discharge low noise condenser fans shall be statically and dynamically balanced direct driven by three-phase motors with permanently lubricated ball bearings and three-phase thermal overload protection. Unit shall be capable of starting and operating at outdoor ambient temperatures from 0F to 125F.

K. Enclosures shall be weather-tight, unit-mounted, NEMA 250, hinged and lockable. Unit mounted starters shall be in the enclosure. Starter shall be across-the-line configuration, factory-mounted and fully pre-wired to the compressor motor(s) and control panel. Unit shall have a single point power connection. Control power transformer shall be factory-installed and factory-wired to provide unit control power. Control panel shall be dead front construction for enhanced service technician safety. Power line connection type shall be standard with a terminal block. Unit wiring shall run in liquid-tight conduit.

L. Furnish chiller with fluid cooled Adaptive Frequency Drive (AFD). AFD efficiency shall be 97% or better at full speed and full load. Fundamental displacement power factor shall be a minimum of 0.96 at all loads for AFD. All other starters shall have a minimum displacement power factor of 0.85. Power semi-conductor and capacitor cooling shall be from a liquid or air cooled heatsink. Unit shall have a single point power connection. Power line connection type shall be standard with a terminal block. Molded case high fault interrupting capacity circuit breaker shall be factory pre-wired with terminal block power connections and equipped with a lockable external operator handle, making it available to disconnect the chiller from main power. Include high short circuit current rating (SCCR) of 65kA. Control power transformer shall be factory-installed and factory-wired to provide unit control power. Unit wiring shall run in liquid-tight conduit. Customer wired 15 amp, 115-volt GFCI convenience outlet shall be factory mounted on the exterior of the control panel.

M. Controls:

1. The microprocessor-based unit controller shall be factory-installed and factory-tested. Digital Communications to BAS system shall consist of a BACnet MS/TP interface via a single twisted pair wiring. Controls and interface to BAS shall be in accordance with Section 230900 Building Automation System.
2. Unit controller shall provide chilled water temperature reset based on return water temperature.
3. Control panel shall provide an alarm relay output that shall energize whenever a fault requiring manual reset is detected by the panel.
4. Color, touch sensitive liquid crystal display (LCD) shall be unit mounted and a minimum of 7" diagonal. Graphical Icons provide links to sub menus on the subsystems operations.
5. Display shall consist of a menu driven interface with easy touch screen navigation to organized sub-system reports for compressor, evaporator, and motor information as well as associated diagnostics.
6. The chiller control panel shall provide password protection of all setpoints
7. The controller shall have the ability to display all primary sub-system operational parameters on dedicated trending graphs. The operator must be able to create up to 6 additional custom trend graphs, choosing up to 10 unique parameters for each graph to trend log data parameters simultaneously over an adjustable period and frequency polling.
8. Chilled water temperature control shall be microprocessor-based, proportional and integral controller to show water and refrigerant temperature, refrigerant pressure, and diagnostics. This microprocessor-based controller is to be supplied with each chiller by the chiller manufacturer.
9. The front of the chiller control panel shall display the following in clear language, without the use of codes, look-up tables, or gauges:

    a. Run time.
    b. Number of starts.
    c. Current chiller operating mode.
    d. Chilled water set point and set point source.
    e. Electrical current limit set point and set point source.
    f. Entering and leaving evaporator water temperatures.
    g. Saturated evaporator and condenser refrigerant temperatures.
    h. Evaporator and condenser refrigerant pressure.
    i. Oil tank pressure.
    j. Oil pump sump pressure.

k. Intermediate oil pressure in the compressor.
l. Compressor motor current per phase.
m. Compressor motor percent RLA.
n. Compressor motor voltage per phase.
o. Phase reversal/unbalance/single phasing and over/under voltage protection.
p. Low chilled water temperature protection.
q. High and low refrigerant pressure protection.
r. Load limit functions (both current based or pulldown rate based) to limit compressor loading on high return water temperature.
s. Condenser fan sequencing to automatically cycle fans in response to load, expansion valve pressure, condenser pressure, and differential pressure to optimize chiller efficiency.
t. Display diagnostics.
u. Oil pressure control based off of maintaining system differential pressure.
v. Compressors: Status (on/off), %RLA, anti-short cycle timer, and automatic compressor lead-lag.
w. Oil loss indication.

10. Phase loss and under voltage relays shall be part of a solid-state sensing circuit with adjustable under voltage setting and isolated output contacts for hard wired connections.
11. Surge suppressors in solid-state power circuits shall provide three-phase protection against damage from supply voltage surges 10 percent or more above nominal line voltage.
12. Unit shall be shipped with factory control and power wiring installed.
13. Weatherproof control panel shall be mounted on chiller, containing starters, power and control wiring, factory wired with terminal block power connection. Provide primary and secondary fused control power transformer.
14. The chiller controller shall utilize a microprocessor that will automatically take action to prevent chiller shutdown due to abnormal operating conditions associated with: evaporator refrigerant temperature, high condensing pressure and motor current overload.
15. Provide the following safety controls with indicating lights or diagnostic readouts:

    a. Low chilled water temperature protection.
    b. High refrigerant pressure.
    c. Low oil flow protection.
    d. Loss of oil diagnostic.
    e. Loss of chilled water flow.
    f. Contact for remote emergency shutdown.
    g. Motor current overload.
    h. Phase reversal/unbalance/single phasing.
    i. Over/under voltage.
    j. Failure of water temperature sensor used by controller.
    k. Compressor status (on or off).

16. Provide the following operating controls:

    a. A variable method to control capacity in order to maintain leaving chilled water temperature based on PI algorithms. Five minute solid state anti-recycle timer to prevent compressor from short cycling. Compressor minimum stop-to-start time limit shall be 2 minutes. If a greater than 5 minute start-to-start.
    b. Chilled water pump output relay that closes when the chiller is given a signal to start.
    c. Load limit functions to limit compressor loading on high return water temperature to prevent nuisance trip outs.
    d. High condenser pressure limit controls that unloads compressors to keep head pressure under control and help prevent high pressure nuisance trip outs on days when outside ambient is above design.
    e. Compressor current limit controls that unloads compressors to help prevent current overload nuisance trip outs.
    f. Auto lead-lag functions that constantly even out run hours and compressor starts automatically. If contractor cannot provide this function, then cycle counter and hour meter shall be provided for each compressor so owner can be instructed by the contractor on how

to manually change lead-lag on compressors and even out compressor starts and running hours.

g. Low ambient lockout control with adjustable setpoint.

h. Condenser fan sequencing which adjusts the speed of all fans automatically in response to ambient, condensing pressure and expansion valve pressure differential thereby optimizing chiller efficiency.

17. Provide user interface on the front of the panel. If display is on the inside of the panel, then a control display access door shall be provided to allow access to the display without removal of panels. Provide user interface with a minimum of the following features:

a. Leaving chilled water setpoint adjustment from LCD input
b. Entering and leaving chilled water temperature output
c. Percent RLA output for each compressor
d. Pressure output of condenser for circuits one and two
e. Pressure output of evaporator for circuits one and two
f. Ambient temperature output
g. Voltage output
h. Current limit setpoint adjustment from LCD input.
i. Remote leaving water temperature setpoint.
j. Alarm indicating light and relay.

N. Install chillers in accordance with manufacturer's instructions. Chillers shall be installed level and on vibration isolators.

O. Chiller startup shall be performed by Factory trained and authorized servicing technicians confirming equipment has been correctly installed and passes specification checklist prior to equipment becoming operational and covered under OEM warranty. Provide startup reports to Architect/Engineer.

230511 POWER VENTILATORS

A. Power ventilators shall be tested and rated in accordance with the standards of AMCA 210 and shall carry the AMCA seal. All fans shall be UL labeled. Fans shall be Cook, Greenheck, Carnes, Twin City, PennBarry, or approved equal.

B. Power roof ventilators shall be centrifugal, direct driven and upblast or downblast as indicated on the drawings with factory aluminum finish. All units shall be provided with bird screen and back draft dampers. Disconnect switches shall be by the Heating and Air Conditioning Contractor. Power roof ventilators shall have spun aluminum hood. Motors shall be EISA 2007 NEMA premium efficiency with efficiency rating stamped on motor nameplate. Direct drive units shall have solid state motor speed controllers with an “OFF” position.

C. In-line fans shall be centrifugal in-line ventilator with direct drive as indicated on the drawings. Housing shall be constructed of steel with removable drive door and access panel. Wheel shall be dynamically and statically balanced. Motor base shall be adjustable and have locking screws and guides to provide correct alignment. Ball bearings shall be heavy-duty self-aligning, relubricable flange type with locking collars. Bearings must be selected for 125,000 hours average service life at maximum cataloged operating speed. Motors shall be EISA 2007 NEMA premium efficiency with efficiency rating stamped on motor nameplate. All units shall be provided with backdraft dampers, hanging vibration isolators, motor/drive guards, and disconnect switches. Direct drive units shall have solid-state motor speed controllers with an “OFF” position.

D. Ceiling exhaust fans shall have plug disconnect switch, interior fiberglass insulation, forward curved centrifugal blower wheel, back draft dampers, permanently lubricated motor, and white steel grille. Units shall have solid-state motor speed controller with an “OFF” position. Furnish wall cap with birdscreen where shown on drawings. Caps shall have baked enamel finish of color selected by the Architect.

E. Roof curbs for roof-mounted equipment shall be provided by the Heating and Air Conditioning Contractor. It shall be the responsibility of the Heating and Air Conditioning Contractor to give the proper locations

and sizes required for all roof openings. Opening will be framed and cut by not the Heating and Air Conditioning Contractor. Roof curbs shall be insulated. Equipment shall be attached to roof curbs with a minimum of two stainless steel fasteners and EPDM washers on each side of roof curb.

230512 DIFFUSERS, GRILLES, AND REGISTERS

A. Diffusers, Grilles, and Registers shall be as manufactured by Carnes, Metal Aire, Titus, Krueger, Price, Duct Sox, or approved equal unless otherwise noted.

B. All diffusers, grilles, and registers shall have a maximum NC level of 25 in the space for the specified airflow, and shall have factory applied white baked enamel finish. Where indicated on drawings to be field painted, white factory finish shall be as necessary to receive field finish painting.

C. Lay-In Supply Air Diffusers: Shall be steel construction, fixed square louvered face, 4-way blow, panel border to drop in 24" x 24" “T” bar ceiling grid, with adjustable vertical pattern. Vertical air adjustment shall be made by adjusting four perimeter blades to force air down in a vertical position.

D. Regular Ceiling Supply Air Diffusers: Shall be steel construction square, fixed square louvered face, 4-way blow, panel border, adjustable vertical pattern, and opposed blade damper.

E. Sidewall Supply Air Grilles and Registers: Shall be steel with adjustable front vertical and back horizontal airfoil vanes on 2/3" centers. Registers shall have opposed blade dampers.

F. Sidewall Linear Bar Grille: Shall be extruded heavy duty aluminum bar blades locked into extruded aluminum border. Blades shall be fixed 0° deflection on 1/2” centers running parallel to the long dimension of the grille with reinforcing support bars. Border shall be 1” width suitable for sidewall mounting complete with precise factory mitered corners and concealed mounting. Border and blade factory finish shall be powder coat. Provide opposed blade damper and plenum box.

G. Slot Diffuser: Shall be complete with factory installed fully adjustable dual air pattern vanes and factory or field insulated plenum. The diffuser shall be constructed of 24-gauge galvanized steel and internally insulated with 1/4" thick, 4-lb/ft^3 density fiberglass insulation. The plenum shall be constructed of 24-gauge galvanized steel and include inlet dampers. All exposed surfaces shall have factory applied white baked enamel finish. The diffuser when shown to be mounted in a lay-in ceiling shall be designed to straddle ceiling tee and have appropriate factory-made notches to accommodate crossing of ceiling grid tees. Provide with appropriate frame where mounted in regular ceiling and include cable operator for inlet damper balancing. The air slots shall be designed for horizontal coanda flow. See Schedule on drawings for size, quantity, ceiling type, and blow direction of slots.

H. Lay-in Ceiling Return Air Grilles: Shall be aluminum 1/2" x 1/2" x 1” egg crate with steel frame and designed to lay in an inverted “T” bar ceiling grid. Grilles shall be full flow across the entire face of grille and tapered up to neck size.

I. Ceiling Return Air Registers: Shall be aluminum 1/2" x 1/2" x 1” egg crate with steel frame and opposed blade dampers. Registers shall be full flow across the entire face of register and tapered up to neck size.

J. Side Wall Return Air Grilles: Shall be heavy duty steel with fixed 40º horizontal all welded face bars. Face bars shall be 1/8" thick with rounded edges.

K. Exhaust Registers: Shall be aluminum construction with fixed blades on 1/2" centers set at 35º angles and opposed blade dampers.

230513 EXPANSION TANKS

A. Expansion tanks shall be shell and bladder type. Shell shall be fabricated steel designed and constructed per ASME Section VIII for 125 pound working pressure and 240 deg. F fluid operating temperature. Bladder shall be heavy-duty butyl rubber appropriate for working fluid and removable for inspection. The tank shall be as manufactured by Bell and Gossett, Wheatley, or Taco. Tank shall be field charged to 30 psig.

230514 PUMPS AND SUCTION DIFFUSERS

A. End suction pumps shall be base mounted centrifugal type with 125# flanged connections and rated for 175-psig and 250°F. Pump and motor shall be mounted on grout-able structural steel channel base with factory-standard integral drain pan with ¾" drain connection. Casing connections shall be drilled and tapped for gauges and seal cavity shall include factory-installed external seal flush line. Pump volute shall be foot mounted back-pullout design (overhung casing designs are not allowed). Pump shall be bronze-fitted with carbon steel shaft, ceramic/EPT mechanical seal, and utilized a dry shaft design with field replaceable slip-on bronze shaft sleeve. Bearing frame shall incorporate maintenance free permanently lubricated and sealed bearings with L10 life of 60,000 hours. Coupler shall be Woods Dura-Flex with zinc shear bolts and covered by OSHA-approved coupling guard. Motors shall be rated NEMA Premium Efficient, comply with EISA 2007 with efficiency rating stamped on motor nameplate, with NEMA MG1, Part 31 design. On motors greater than 10 hp served by variable speed drives, provide shaft grounding rings. All three phase motors shall have phase loss protection. The entire pump shall be designed and guaranteed for the intended application and shall be Bell and Gossett, Taco, or Armstrong.

B. Condensate pumps shall be UL listed complete unit with float, ABS tank, snap action safety switch, thermal overload protection, discharge check valve, and 3-prong molded plug. Units shall have capacity of 260 GPH @ 9 FT of head and 1/12 HP 115V-1Ø. Coordinate power receptacle location with Electrical Contractor. Pump float safety switches shall be wired to deenergize unit served on excessive levels of condensate in tank.

C. Pumps indicated on the drawings shall have variable frequency drive to provide flow modulation. Drive shall be mounted on Mechanical Room wall. **Drives and control wiring between DDC system and the drives shall be by the BAS Contractor.**

D. Install pumps per manufacturer's recommendations. All bases shall be grouted. Pipe drain pans to drain. Properly support adjacent piping to ensure no external forces are exerted on the pump casing. Perform preliminary pump and motor shaft alignment upon initial receipt of unit, after pump is piped and grouted, and after system is filled and flushed. Pumps shall NOT be run dry to check rotation. Final alignment shall utilize a laser alignment tool, and shall be performed after system reaches normal operating temperature. Provide verified laser alignment results to the owner, demonstrating 0.003" parallel and 3° angular alignments.

E. End suction pumps shall be provided with a multi-function inlet suction diffuser. Suction diffuser body and cover plate shall be ductile iron, rated for 175-psig. The suction guide shall include full length stainless steel straightening vanes, permanent stainless steel strainer, disposable 16 mesh bronze start-up strainer, blow down ports, and metering ports. Startup strainers shall be attached to adjacent shut-off valve with copper wire after removal. Install foot supports under each suction diffuser to alleviate any external stresses on the pump.

230515 AIR SEPARATORS

A. Air separators shall have tangential inlet and outlet connections, blowdown connections, internal perforated stainless steel air collector tube, internal perforated galvanized water strainer, and automatic air vent. Water strainer shall have 3/16" perforations and a free area of not less than 5 times the cross sectional area of the connecting pipe. Unit shall be ASME and National Board stamped for 125 PSIG working pressure. Heating and Air Conditioning Contractor shall provide piping from air separator's blowdown connection to nearest floor drain.

230516 HEATERS

A. Electric unit heaters shall be listed by Underwriters Laboratories, Inc., and shall bear the appropriate UL label. Heaters shall be furnished and installed in accordance with the manufacturers' published recommendations. The elements shall be metal sheath fintube type. Heaters shall be complete with adjustable discharge louvers, ceiling mounts, built-in contactors with 24 volt control circuit, built-in fuses, 18 gauge steel cabinet, built-in thermal overload protection, combination fan guard and motor mount,

continuous duty motor, unit mounted thermostat, and separate field installed-unit mounted power disconnect switch. Unit heaters shall be Markel Series 5100, Raywall, Indeeco, or approved equal.

B. Electric baseboard heaters shall be commercial-grade furnished and installed complete with all necessary heating elements, brackets, and closures, splice plates, interior and exterior corners, and accessible wiring compartment. Maximum leaving air temperature at the outlet and enclosure surface temperature, under continuous operation, shall not exceed 200°F. Heaters shall be Markel Series 2900C, Q-Mark, Raywall or approved equal complete with UL label.

Heating elements shall consist of stainless steel element rod with aluminum fins. Maximum watt density per linear foot of element shall not exceed 250 watts. Enclosures shall be steel with thicknesses not less than 18 gauge front and 22 gauge back and shall be rigidly reinforced. Enclosures shall be wall hung with bottom at elevation above the finished floor as shown on the drawings and shall be suitable for the space available. End plates and corner pieces shall be die formed with round edges, fit flush with enclosure surface, and be neat in appearance. No direct contact between enclosure and heating element will be permitted. Enclosure shall be painted with rust-inhibiting paint at the factory and shall have baked enamel finish of color selected by Architect. Connection box shall be designed to permit power supply and control wiring from bottom, rear, right or left side as required. Thermostat shall be built-in double pole double throw adjustable with extra sensitive bulb and capillary. Thermostat shall have positive off position and be within unit enclosure or junction box. Limit controls shall be continuous end-to-end automatic reset thermal overheat; line voltage protection shall be provided with each individual baseboard heater to protect from overheating due to any cause. Baseboard unit shall be furnished complete, factory prewired and ready to receive branch circuit and connections. Each heater shall be provided with a factory-installed safety disconnect switch or circuit breaker installed in the housing or in an auxiliary matching control section or have thermostat with positive off position.

230517 VALVES

A. Valves shall be furnished as specified and as shown on the plans. All valves shall have manufacturer's metal identification disc under the handle nut. Provide valve extension handles for all valves in chilled water piping systems. Seats for iron body valves shall be renewable. Valves shall be by a single manufacturer unless noted otherwise. Provide a 3/4" diameter dot on lay-in ceiling grid below all new valve locations. Dot color shall be same as that color specified hereinafter for that piping's finish painting. Provide 19 gauge polished brass valve tag on all valves. Heating and Air Conditioning Contractor shall furnish for new valves a schedule mounted under glass in a frame in the main mechanical room.

B. Check valves up to 2" shall be bronze body swing check with Teflon disc and stainless trim. Check valves 2-1/2" and over shall be the flanged globe non-slam type with ductile iron body, 316 stainless steel trim, and stainless steel or bronze bushings and seats.

C. Ball valves shall have bronze body, synthetic rubber seat rated at 250°F, ball and seat and indicating dial with memory stop. Valves on chilled water systems shall have stem extensions for insulation coverage.

D. Butterfly valve shall have ductile iron lug body, aluminum bronze disc, synthetic rubber seats rated at 250°F, ductile iron or aluminum lock handle with memory stop. Valves 4" and larger shall be equipped with gear operator with handwheel. All gear operators shall have traveling indicator and adjustable stops. Valves on chilled water and condenser water systems shall have stem extensions for insulation coverage.

SIZES UP TO AND INCLUDING 2" BRONZE BODY SCREW IN

	BALL	CHECK
Hammond	8201	IB 946
Nibco	T-580	T-433-Y
Milwaukee	BA-200	510T

SIZES 2-1/2" AND OVER FLANGE CONNECTED IRON BODY

	CHECK	BUTTERFLY
Hammond	9354	6200
Nibco	F-910	LD-3100
Milwaukee	1800	ML-122B

E. Multipurpose valves shall be straight pattern design to perform functions of non-slam check valve, throttling valve, shutoff valve and calibrated balancing valve. Valve shall be cast iron suitable for 175 PSI working pressure with bronze seat, replaceable bronze disc with EPDM seat insert, stainless steel stem, and chatter preventing stainless steel spring. Valves shall be Bell and Gossett, Armstrong, or Taco.

F. Automatic Flow Control Valves:

1. Manufacturers: Flow Design, Inc., Autoflow, Griswold, Bell & Gossett, PRO Hydronic Specialties, Nexus, or approved equal.
2. Design:
    a. Valves shall be pressure independent type within operating pressure range.
    b. The GPM for the automatic flow control valves shall be factory set and shall automatically limit the rate of flow to within 5% of the specified amount.
    c. The 1/2" - 2", the flow cartridge shall be removable from the Y-body housing without the use of special tools to provide access for regulator changeout, inspection, and cleaning without breaking the main piping. (Access shall be similar to that provided for removal of a Y-strainer screen).
    d. True operating ranges of 2-32 PSID or 5-60 PSID are required. The design flow should be achieved at the minimum PSI differential. A 50% safety factory applied to the lower operating range is not acceptable.
    e. Each valve shall have two P/T ports.
    f. All automatic flow control devices shall be supplied by a single source and certified flow tests, witnessed by a Professional Engineer, shall be available.
    g. Five-year product warranty and free first year cartridge exchange.
3. Construction:
    a. The internal wear surfaces of the valve cartridge shall be electroless nickel or stainless steel.
    b. The internal flow cartridge body shall have machined threads so the spring free height may be compensated for without the use of fixed shims. A crimpled sheet metal design is not acceptable.
    c. The internal flow cartridge shall be permanently marked with the GPM and spring range.
    d. For 1/2" through 2" pipe sizes: An assembly shall consist of a brass Y-type body, integral brass body ball valve and “O” ring type union.
    e. For 2-1/2" and larger flanged connections: Ductile iron body suitable for mounting wafer style between standard 150# or 300# flanges. The long flange bolts and nuts shall be provided with each control valve.
    f. All valves shall be factory leak tested @ 100 PSI air under water.
    g. Valve bodies shall have flow direction indicated.
    h. Valves shall have attached and permanent labels indicating unit served, flow rate, pressure control range, manufacturer, and model number.
4. Minimum Ratings:
    a. 1/2" through 2" pipe size: 400 PSIG at 250°F.
    b. 2-1/2" through 14" pipe size: 600 PSIG at 250°F.
    c. 16" through 30" pipe size: 250 PSIG at 250°F.
5. Flow Verification:
    a. As part of testing and balancing, the differential pressure across the Automatic Flow Control Valve shall be measured for flow verification and to determine the amount of system over heading or under pumping.
    b. The flow shall be verified by measuring the differential pressure across the coil served or the wide-open temperature control valve and calculation the flow using the coil or valve Cv.
6. Test Kit: Two differential test kits shall be supplied to the Owner by the Heating and Air Conditioning Contractor to verify flow and measure overheading. Kits shall consist of a 4-1/2" diaphragm gauge equipped with ten-foot hoses and P/T adapters all housed in a vinyl case with instructions. Calibration shall be 0-35 PSID for 2-32 PSI spring range or 0-65 PSID for 5-60 PSI range.

7. Installation:
    a. Install automatic flow control valves on the return lines of coils, etc. as indicated on the plans. Balancing valve on supply side is not acceptable.
    b. The standard ports and handles shall clear 1" thick insulation. Handle and port extensions are required and shall be provided for over 1" thick insulation. Coordinate with insulation thickness schedule indicated on the drawings.
    c. Install, on the supply side of coils, a Y-strainer with a brass blowdown valve with 3/4" hose end connection with cap and chain.
    d. Flow control valves shall be 5-60 PSID range.

230518 CONTROLS

A. See Section 230900.

230519 WATER TREATMENT AND FEED SYSTEMS

A. **Heating and Air Conditioning Contractor shall provide flushing of new piping and equipment, chemical treatment equipment, and chemical treatment for closed hydronic systems. Chemical treatment chemicals shall be coordinated with Brunswick County and their Chemical Treatment Contractor.**

B. Provide a 5 gallon bypass type chemical feed tank for each hydronic piping system designed for 200 psi working pressure. Tank shall be vertical style with removable fill cap and supply and return piping connections. Chemical feed tank shall include provisions for a 20 micron replacement cartridge filter for use in system clean-up. Provide see-through type paddle wheel site flow indicator on leaving side of chemical feed tank.

C. Water Treatment:
    1. Water treatment service shall be provided by an experienced (10 years minimum) HVAC water treatment specialist as a subcontract to the Heating and Air Conditioning Contractor. HVAC water treatment specialist shall have the capability, and shall perform water treatment services specified herein.
    2. Chemicals used for water treatment including, but not necessarily limited to, alkalines, detergents, degreasers, inhibitors, and coloring agents, shall be employed as recommended by the manufacturer. Chemicals shall be compatible with piping system materials and connected equipment. Chemicals shall comply with environmental regulations for discharge.
    3. Scope of water treatment services shall include initial flushing and clean-out, chemical analysis, chemical treatment, and a one (1) year service program, including chemicals, to commence on date of final acceptance.

D. Initial Flushing and Clean-Out:
    1. Prior to extended operation and connection to equipment and coils, all new piping systems shall be flushed with clean water and the strainers cleaned at least three times to remove foreign matter. Flow rates in sections being flushed shall be 6 feet per second minimum. All strainers at equipment shall be periodically checked and cleaned until flushing operations reveal the absence of foreign materials.
    2. Notify Architect and Engineer 48 hours in advance of all flushing and strainer cleaning so that it can be witnessed.
    3. Degreasers and/or alkaline chemicals shall be added to the system to remove oil, grease, pipe dope and other detrimental materials. Solution shall be circulated for a minimum of 24 hours. The system shall be drained and filled with fresh water following flushing/degreasing.
    4. Provide sidestream filtration utilizing filters in the chemical feed tank for system clean-up as necessary. Water Treatment Contractor shall provide 20 micron filters.

E. Hydronic Piping Systems Chemical Treatment – Chilled Water Systems:
    1. Provide initial chemical analysis of filled hydronic systems following initial flushing and clean-out.

2. Provide and add chemical treatment chemicals and corrosion inhibitors to new and renovated hydronic systems based on initial chemical analysis to establish levels as follows:

pH:	9.0 – 10.5
P Alkalinity:	100 – 500 ppm
Boron:	100 – 200 ppm
Chemical Oxygen Demand:	Up to 100 ppm
Soluble Copper:	Up to 0.2 ppm
Total Dissolved Solids:	Up to 10 ppm
Ammonia:	Up to 20 ppm
Free Caustic Alkalinity:	Up to 20 ppm
Total Aerobic Plate Count:	Up to 1000 organisms/ML
Total Anaerobic Plate Count:	Up to 100 organisms/ML
Nitrate Reducers:	Up to 100 organisms/ML
Sulfate Reducers:	0 organisms/ML
Iron Bacteria:	0 organisms/ML

F. Service Program:

1. Water treatment specialist shall provide monthly maintenance services for a period of one (1) year commencing on the date of final acceptance of the project. Services shall include chemicals. Costs for services shall be included in the Contractor's Bid. Usual and customary maintenance practices shall be by the Owner.
2. Quarterly maintenance services shall consist of site visits by factory trained and authorized personnel to sample and analyze hydronic systems water quality and maintain chemical and biological levels as specified above.

G. Test Reports:

1. Submit water treatment test reports in typewritten form documenting acceptable flushing and treatment, and hydronic piping systems chemical treatment.
2. Under service program, submit quarterly water treatment test reports directly to Owner documenting acceptable chemical and biological levels as specified above.

230520 HEAT TRACE CABLE

A. See drawing for detail and specification of heat trace cable. Heat trace cable shall be installed on all exterior above grade water piping to 24" below grade, and on all piping, valves, etc.at the chillers.

230521 FIRE, MANUAL, AND MOTORIZED DAMPERS

A. Fire dampers shall be provided in the duct systems in accordance with NFPA Standard No. 90A and shall conform to NFPA Standard No. 90A for materials and workmanship. The dampers shall be spring loaded dynamic rated multi-leaf type UL approved and labeled for installation into the rated assembly (a 1-1/2 hour damper for a 2 hour rated assembly and two 3 hour dampers for a 4 hour rated assembly) and shall be installed according to the manufacturer's recommendations. Dampers shall be Ruskin, Pottorff, Prefco, Air Balance, United Enertech, or approved equal.

B. Manual and Motorized dampers shall be low leakage type provided in the duct systems as indicated on the drawings in accordance with NFPA Standard No. 90A and shall conform to NFPA Standard No. 90A for materials and workmanship. Blades shall have extruded vinyl double edge seals. Jambs shall have flexible metal compression type seals. Maximum damper leakage shall be 0.5% at pressure differentials under 4.0 in w.g. Leakage ratings shall be when tested in accordance with AMCA Standard 500. Motorized dampers shall have electric operators and shall be normally closed, unless indicated otherwise on the drawings. Wiring to operators shall be by the Heating and Air Conditioning Contractor. Manual dampers shall have handle and locking quadrant. To facilitate service access and insulation installation, manual damper handles shall be on 2" stand-off brackets. Handles shall be spray painted red. Dampers shall be installed according to the manufacturer's recommendations. Dampers shall be Ruskin, Pottorff, Prefco, Air Balance, United Enertech, or approved equal.

230522 ACCESS DOORS

A. Access doors shall be provided for access to all fire and motorized dampers, duct mounted smoke detectors, and duct systems.

B. Duct mounted access doors shall be constructed of No. 22 US gauge zinc-coated sheet steel and shall be gasketed, air tight and provided with not less than two (2) cam-type latches. Doors shall be square and shall be 12" x 12" or two inches less than the height of the duct. Doors shall be two-piece with 1" rigid insulation between the metal sides. Doors shall have engraved plastic laminated labels with 1/2" tall letters indicating item accessed through door.

C. Wall and ceiling access doors shall be provided as specified in Section 083113.

D. Provide 3/4" diameter red dot on ceiling grid below all duct access doors.

230523 ELECTRICAL

A. Electrical circuit sizes are based on capacities of the drawings and it shall be the responsibility of Heating and Air Conditioning Contractor to change any and all electrical work in order to fit mechanical equipment. Heating and Air Conditioning Contractor shall coordinate with Electrical Contractor to assure that all units are 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 Heating and Air Conditioning Contractor. Flexible electrical conduits shall be 18 inches in length maximum. All electrical work shall be installed in accordance with codes having jurisdiction and the Electrical Division, Division 26, of these specifications.

B. Starters shall have integral 120V Control power transformer. Starters shall have holding coil for 120V control with hand-off-auto switch. The starters shall be inoperative if the thermal unit is removed. All magnetic starters shall be NEMA sized with applicable melting alloy overload relays and applicable enclosure. Starters shall be GE or approved equals by Allen-Bradley, Square D, Siemens or Cutler-Hammer.

C. All three phase motors shall be provided with phase loss protection.

D. Fused disconnect switches shall be per the Electrical Division, Division 26, of these specifications.

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 per the Electrical Division, Division 26, of these specifications.

230524 DUCTWORK

A. Mechanical drawings are schematic only and do not show all offsets etc. required. Heating and Air Conditioning Contractor shall familiarize himself with the complete contract documents and site conditions before fabricating ductwork. Any changes to ductwork found necessary to accommodate the conditions at the building shall be made without additional cost to the Owner, and as directed by the Engineer.

B. During construction, interior of ductwork shall be protected. All open ends of ductwork shall be covered with self-adhesive 3 mil polyethylene film.

C. Ductwork shall be of galvanized steel with standard gauges and construction in accordance with the recommendations of SMACNA HVAC Duct Construction Standards, Metal and Flexible, Third Addition, 2005 for appropriate pressure class. Supply ductwork between air handling units and room terminal boxes shall be 3” w.g. pressure class construction classification with gauges, construction, etc. as necessary. Airfoil turning vanes with 1-1/8" spacing and rail support system shall be installed in all 90º elbows. Ductwork shall be cross broken on all sides and shall be supported at both ends of each joint and at 10'-0" intervals maximum with galvanized angles supported by galvanized threaded rods of sizes and spacing in accordance with SMACNA. Ductwork to be exposed shall be constructed in a first class, neat, professional manner and exposed ductwork with excessive hammer marks shall be replaced. Round supply takeoffs from trunk ducts shall be made with factory 45º entry branch rectangular to round type fittings. Provide

dampers in takeoff fittings where indicated on drawings. Damper handles shall be on 2" stand-off brackets. Handles shall be spray painted red. Splitter dampers shall be provided where indicated with adjustment quadrant locking device and shall be constructed of two thicknesses of 24-gauge-galvanized steel. All dimensions on the drawings are free inside dimensions. All components of the air distribution system shall be mechanically fastened with at least three equally spaced sheet metal screws with screws not more than on 12" centers. All duct joints shall be sealed in accordance with SMACNA Seal Class A before insulation is applied. All sealants shall meet the provisions of UL181. Sealant shall be Sonolastic NP1.

D. Final 8'–0" of the runout to the air outlet may be factory fabricated flexible ducts complying with NFPA Standard No. 90A, UL 181, and shall be UL Class 1 R-6 insulated type with foil vapor barrier. The flexible duct shall be air tight for factory test when bent to full recommended radius and under not less than 10" water gauge internal pressure and shall be limited to 8'-0" maximum length. Flexible ducts shall be supported by galvanized steel straps in accordance with SMACNA at intervals not exceeding 4'-0" and at each change of direction. Flexible ducts shall have a minimum of one support.

230525 PIPING

A. The Heating and Air Conditioning Contractor shall furnish all piping and supports necessary to provide a complete system as shown or intended by the plans and specifications. All piping shall be inspected, tested, and approved before being insulated or concealed. Piping 2" and smaller shall be welded or have screwed fittings with extra heavy nipples, unless otherwise noted. Piping 2-1/2" and larger shall have welded fittings of the same material and weight as the piping in which they are installed. Pipe shall be clean, run generally parallel to the building and have all open ends closed with iron caps at all times. Eccentric reducers shall be used in horizontal runs and concentric reducers in vertical runs. All piping and fittings shall have manufacturer’s identification and ASTM designation incorporated thereon.

B. Chilled water system piping shall be standard weight Schedule 40 black steel in accordance with ASTM Specification A-53. All fittings shall be Schedule 40. Piping 1" and smaller may be Type L copper with joints soldered with 95-5 solder. Piping shall have dielectric union or bronze ball valve at connection to ferrous pipe.

C. Chilled water piping where underground shall be pre-insulated-piping conduit with Schedule 40 A53 steel pipe, PVC ASTM D1784 or 125 mils thick high density polyethylene pipe insulation jacket, and 1" thick minimum polyurethane foam insulation. Piping shall have welded joints. Fittings shall be field insulated per pipe system manufacturer’s recommendations. Systems shall be anchored and supported per manufacturer’s recommendations. The Contractor shall provide installation shop drawings of each entire system showing field measured lengths, properly sized thrust blocks, anchors, supports, and building entry details. The manufacturer shall provide an on-site inspector at the beginning of the construction for a minimum of two days and shall provide a written certification that the installation has been performed according to manufacturer’s recommendations. Pre-insulated piping system shall be Thermal Pipe Systems, Perma-Pipe, Thermacor, or approved equal.

At Contractor’s option, underground chilled water piping may be PP-R with fused joints and appropriate fittings. Contractor must be certified by manufacturer for installation of PP-R product. Installation shall be in accordance with all aspects of the manufacturer’s installation instructions. Piping shall be Aquatherm Blue Pipe SDR 11 or approved equal.

1. Provide Schedule 40 steel sleeves where PP-R piping penetrates concrete slabs or block foundations.
2. Underground PP-R piping shall be uninsulated but shall be encased by 12” thick minimum backfilling of packed, dry sand.
3. Any portion of PP-R piping that is aboveground shall be insulated as specified for chilled water piping.

D. Make-up water piping shall be Type L copper with all joints soldered with 95-5 solder. Piping shall have dielectric union at connection to ferrous pipe.

E. Drain pan condensate and pumped condensate piping above slab shall be Type L copper with all joints soldered with 95-5 solder where interior. Piping shall have dielectric union at connection to ferrous pipe.

Drain pan condensate piping shall have a minimum slope of 1/4" per linear foot and shall be at least as large as unit condensate connection.

F. Refrigerant piping shall be capped and dehydrated Type “L” hard drawn copper with wrought fittings. All joints shall be brazed with silver brazing alloys according to manufacturer’s published recommendations.

G. Welding material and labor shall be in accordance with welding procedures of the American Standards Code for Pressure Piping ASA B31.9. Welders shall be fully qualified in above specified procedure, tested, and so certified by an approved Welding Bureau of Locally Recognized Testing Authority. Welding shall be electric arc or oxyacetylene welding method as approved using electrodes and rods that comply with ASTM specifications.

H. Swing joints or loops shall be provided wherever necessary to allow for expansion of piping. Broken piping or fittings shall be removed and replaced at the Heating and Air Conditioning Contractor’s expense.

230526 PIPE HANGERS

A. All piping shall be neatly and securely supported by hangers from fire resistance rated structural elements of the building spaced in the following manner:

1. Steel Piping 1-1/4" and smaller - 7'-0" O.C.
2. Steel Piping 1-1/2" and larger - 10'-0" O.C.
3. Copper Piping 1-1/4" and smaller - 6'-0" O.C.
4. Copper Piping 1-1/2" and larger - 10'-0" O.C.
5. PP-R Piping – per manufacturer’s installation instructions.
6. Provide 2 hangers at each change in direction.

B. Hangers shall be the Clevis type as manufactured by Modern Fig. 590, B-Line Fig. B 3100, or Grinnell Fig. 260 complete with hanger rods of size to conform to the type of hanger and pipe supported. Hangers shall be attached to the building by beam clamps or bolted to bar joist. At hangers provide 16" long 16 gauge galvanized sheet metal protection saddle three times the nominal pipe diameter. Under no condition shall hangers be connected directly to insulated pipe. Saddles shall be Modern Type A, B-Line Fig. B 3151, or Grinnell Fig. 167.

C. Hangers for vertical piping shall be riser clamp design as manufactured by Modern Fig. 500, B-Line Fig. B3373 or Grinnell Fig. 261. Riser clamps shall be installed on top of each floor penetration.

230527 INSULATION

A. All piping and ductwork shall be inspected and tested before insulation is applied. All insulation shall meet UL 723 and ASTM-E84 flame spread and smoke developed requirements of 25/50 and shall comply with NFPA 90A and the latest edition of the NC Building Code. Insulation shall be Certainteed, Owen Corning, Knauf, Johns-Manville, Trymer, Hi-Therm, or Dyplast.

B. All air conditioning supply, return, relief/exhaust, and outside air ducts concealed above a ceiling and the back of all diffusers and grilles shall be externally insulated with 2" thick 1 lb. density foil scrim kraft jacketed insulation. Adhere insulation to duct with fire retardant adhesive in sufficient quantities to prevent sagging. Ducts with a width over 30" shall be further secured on all sides with mechanical fasteners on 18" maximum centers. Insulation shall be butted with facing overlapping all joints at least 2" and sealed with fire retardant vapor barrier adhesive. External duct insulation shall be continuous around ductwork and board insulation at duct hanger. On round ducts, duct hanger shall be outside duct insulation. Tape all joints, breaks, punctures, and any penetrations with SMACNA foil faced kraft duct tape.

C. Where externally insulated ductwork is supported by angles, provide 6” long x duct width x 1-1/2” thick 6.0 pound density board insulation on bottom of duct at hanger support. External duct insulation shall be continuous around ductwork and board insulation at duct hanger. On round ducts, duct hanger shall be outside duct insulation.

D. All air conditioning supply, return, relief/exhaust, and outside air ducts exposed in mechanical equipment rooms, in finished areas, and where indicated for sound attenuation shall be externally insulated. Insulation shall be 2" thick 3.0 lb. density board insulation with FRK facing. All joints shall be taped per manufacturer's recommendations. Insulation shall be completely secured to ductwork with pins and washers on all surfaces and sides.

E. Where indicated on drawings, air conditioning return air ducts shall be internally insulated. Ducts shall be increased 2" in size from sizes shown on drawings to compensate for thickness of liner. Ducts to be internally insulated shall be lined with 1" thick 2.0 lb. per cubic foot density duct liner with acrylic coating on one side. The liner shall be applied to the inside of the duct with the coated side to the air stream and shall be secured to the duct by an approved adhesive, completely coating the clean sheet metal. Coated duct liner shall be cut to assure overlapped and compressed longitudinal corner joints. Apply liner with coated surface facing the air stream and adhere with 100% coverage of fire retardant adhesive. Coat all exposed leading edges and all transverse joints with fire retardant adhesive. The liner shall be additionally secured with mechanical fasteners that shall compress the duct liner sufficiently to hold it firmly in place. Fasteners shall start within 3" from the longitudinal joints and shall be spaced at a maximum of 12" O.C. around the perimeter of the duct. Coat all exposed joints and edges of transverse joints with fire retardant adhesive.

F. All chilled water system supply and return piping, fittings, valves, etc., shall be insulated with rigid 2.3 lb/cubic feet phenolic insulation with a thermal conductivity of 0.15 btu-in/hr-ft^2-°F or lower at 75°F equal to Trymer Green, Hi-Therm, or Dyplast DyTherm. Insulation and vapor retarder shall not exceed a ASTM E-84 flame/smoke rating of 25/50. Provide Saran 540 vapor retarder film factory applied and Saran vapor retarder tape field applied. All butt and longitudinal joints shall be sealed. Fittings and valves shall be insulated with pre-formed phenolic fittings or mitered sections of pipe covering and covered with Saran 520 tape. Fiberglass fittings will not be permitted. Provide a 24" section of insulation for each pipe hanger to be installed by Heating and Air Conditioning Contractor at time pipe hanger and pipe are installed. Install insulation in such a manner as required to provide a complete vapor barrier. Piping insulation thickness shall be as shown in the schedule on the drawings. All piping and fittings shall be clean and dry prior to installation of the insulation. Piping exposed in occupied spaces or mechanical spaces shall have canvas jacket lagged in place for painting.

1. All insulation shall be tightly butted and free of voids and gaps. Vapor Retarder must be continuous. All fasteners and bands shall be neatly aligned and overall work must be of high quality appearance and workmanship.
2. In below ambient systems, staples, rivets, screws and other fasteners capable of penetrating the vapor retarder shall not be used.
3. Lap joint of vapor retarder to be sealed using SSL tape. Vapor retarder butt joints shall be covered with Saran 520 Vapor Retarder Tape.
4. Elbows and fittings shall be wrapped with Saran 520 Vapor Retarder Tape in a spiral fashion. Use a minimum amount of overlap between successive courses of spiral wrapped Saran Tape.
5. Insulation sections in hangar saddles shall be phenolic for pipes less than 16 NPS. At 10 feet hangar spacing and on pipes 16 NPS and larger, the bottom insulation sections in hanger saddles shall be 3.75 lb. per cubic foot rigid phenolic foam insulation for resistance to compression. Saddles shall wrap the insulation in an arc between 120° and 180°F depending upon the load.
6. When Saran vapor retarder film is used without PVC jacketing, a 1″-wide or greater filament tape or Saran 520 tape with a 25% (1-1/4 wraps) circumferential overlap shall be wrapped around the outside of the Saran 540 vapor retarder on 12" centers.

G. Air separators shall be insulated with same insulation material and thickness as connected piping. Chilled water system pumps shall be insulated with 1-1/2" thick blocks of 2.3 lb/cu ft. density phenolic rigid foam insulation with vapor retarder. Insulation shall be secured with stainless steel straps. Insulation on piping and equipment shall have canvas jacket lagged in place for painting.

H. Insulation on pumps shall be formed such that it can be removed for pump servicing.

I. Air handling unit drain pan condensate piping on interior, pumped condensate piping, make-up water piping, and all refrigerant piping shall be insulated with tubular closed cell elastomeric insulation with all

joints butted and cemented tight. Insulation on make-up water piping and interior condensate piping shall be 1" thick. Insulation on refrigerant piping shall be 1-1/2" thick. Make-up water piping shall have canvas jacket lagged in place for painting.

J. Exposed piping in occupied spaces within 8'-0" of the floor, all exterior refrigerant piping, and all exterior hydronic piping insulation above grade shall be provided with a protective aluminum jacket with a factory-applied poly backing moisture barrier. Aluminum jackets shall be cross-crimped (longitudinally corrugated) for strength. Aluminum jackets shall be not less than 0.016" thick and shall be secured with aluminum or stainless steel screw; not more than 8" apart. Each jacket shall be applied by turning a 1" hem inward on one longitudinal edge and then lapping the hemmed edge over the unhemmed edge. The jacket may be machine cut to produce a straight smooth edge and the hem omitted. The longitudinal and circumferential seams shall be lapped not less than 2". Jackets on horizontal lines shall be so installed that the longitudinal seams are on the bottom half of the pipe with the seam of each jacket slightly offset from the seam of the adjacent jackets; top edge shall overlap bottom edge. The jackets on vertical lines and lines pitched from the horizontal shall be installed from low point to high point so that the lower circumferential edge of each jacket overlaps the jacket below it. Special fitting jackets conforming to the above with the exception of longitudinal lapping dimensions and location of seams shall be used for fittings, valves, and flanges. Jackets for fittings, valves, and flanges shall be properly overlapped and secured. Equivalent aluminum jacketing system, when approved, will be acceptable.

230528 SPECIALTIES

A. Thermometers (9" long) and gauges (4-1/2" dial) shall have metal case with white backgrounds, black numerals and graduations, and red non-mercury, non-alcohol indicating fluid. Ranges shall be selected to indicate operating conditions at mid-scale. Accuracy shall be within 1% of scale range. Pressure gauges shall be compound. Mounting provisions shall provide for insertion of well with separable socket into piping at an angle to permit reading from the floor and shall be of adequate length to project through insulation. Thermometers and gauges shall be Bitmet, Mueller, Taylor, or approved equal. Gauges shall have shut-off cocks.

B. Air vents shall be provided at all points on the piping systems where required to eliminate air from the system. The air vents shall be manual or high capacity automatic type as indicated and manufactured by Bell and Gossett, Hoffman or Armstrong.

C. Strainers shall be screwed (2" and smaller) or flanged (2-1/2" and larger), Y type, 125 pounds, with removable stainless steel screen and shall be provided with close-nipple blowout and ball valve on discharge side. Screen perforations shall be suitable for water flow as appropriate. Screen perforations in strainers at chillers shall be per chiller manufacturer's installation requirements.

D. Pressure reducing valves shall have body and all working parts of brass, built in strainer, and factory set at 30 psig. Valve shall be Bell and Gossett, Taco or Sarco.

E. Floor, wall and ceiling plates or escutcheons of size to fit pipe covering shall be installed where pipes pass thru finished areas and shall be chromium plated spring type as manufactured by Kenney, Connecticut Stamping and Bending Company, Dearborne or approved equal.

F. Pressure relief valve shall be ASME and NB approved with setting and capacity as shown on the drawings or as required. All working parts shall be of non-ferrous metal. The valves shall be Bell and Gossett, Taco, or Sarco.

G. Unions or flanges shall be provided throughout the piping system to facilitate the removal and servicing of all valves, equipment, items, etc.

H. Site flow indicator shall be carbon steel with two tempered glass windows on opposite sides of body rated for 200 P.S.I. Five-bladed propeller shall be "Delrin" material rated for 350°F.

I. Pressure and temperature ports shall be 1/4" MPT fitting to receive either a temperature or pressure probe 1/8" OD. Fitting shall be solid brass with two valve cores of Nordel (Max 275°F) at 500 PSI, fitted with a

color-coded cap strap with gasket, and shall be rated at 1000 PSIG at 140°F. Provide two (2) temperature and pressure probe readout kits to Owner for maintenance use.

J. Flexible connectors shall be provided in piping connections to pumps and chillers. Flexible connectors shall be annular, close pitch hose of stainless steel with stainless steel braid. End fittings shall be male pipe thread or 150 lb. flange as necessary for mating equipment and piping. Flexible connectors on condenser water piping and cooling tower makeup water piping where entering the building shall have connector length sufficient to accommodate 1/2" maximum permanent offset.

230529 FOUNDATIONS

A. All concrete and reinforcing steel for foundation slabs under equipment shall be provided by the Heating and Air Conditioning Contractor. Foundations shall extend beyond all equipment by 4" in all directions and shall be made from 3,500 PSI concrete reinforced with 10/10 x 6/6 wire mesh. Foundation surfaces shall be troweled smooth and edges shall be tooled. Equipment pads shall be painted OSHA approved yellow.

230530 VIBRATION ISOLATION

A. Pad type isolators shall be 3/4" thick bridge bearing quality neoprene ribbed or waffled on both sides. Pads shall be selected for a maximum durometer of 50 and designed for 15% deflection. Where required, steel load-spreading plates shall be incorporated between the equipment and the neoprene pad.

B. Flexible duct connections, both at inlet and discharge of units, shall be made of 30 oz. workinglass fiber coated with neoprene, sewn together at edges and joints. These flexible connections shall withstand the operating air-pressure, shall not permit air leakage, and shall not transmit vibration.

230531 OPENINGS

A. The Heating and Air Conditioning Contractor shall furnish all blockouts, sleeves, and openings required for his work. Pipe sleeves, where firestop penetration system allows, shall be standard weight black steel pipe and shall be provided where pipes pass through walls and floor. Sleeves through walls shall butt flush with the wall finish and shall be of sufficient size to permit passage of pipe covering through the area where pipe is installed. Sleeves through floors shall extend 3/4" above the finished floor and sealed watertight. Any penetrations of ducts through floor shall be curbed 3" high x 6" wide with concrete. 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 Heating and Air Conditioning Contractor. Failure to indicate such openings in time to avoid delaying the project shall result in the Heating and Air Conditioning Contractor providing all cutting and repairing at his 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.

230532 COLOR CODING/PAINTING

A. Insulation on new piping and equipment shall be finished with color coded canvas jacket. Non-insulated piping in mechanical equipment rooms shall be painted with two coats of gloss enamel. Painting shall be primed and in accordance with the painting section of these specifications. Color coding shall be as follows:

1. Chilled Water Supply and Return Piping – Light Blue.
2. Make-Up Water - Dark Blue.
3. All Ferrous Valves, Hangers, and Supports - Black.

4. All exposed mechanical equipment in finished areas including ductwork, piping hangers, etc., shall be painted the same color as the adjacent ceiling and walls. Heating and Air Conditioning Contractor shall treat all items as necessary to receive paint.

230533 PIPE MARKERS

A. Markers shall have wording, wording colors, and wording background in accordance with ANSI A13.1. Markers shall have letters approximately 1" high on appropriate background, flow arrows, and shall be located on the new pipe at intervals not exceeding 10'-0" where in mechanical spaces and 25'-0" intervals where above ceilings. Markers shall be plastic with markers on piping completely encircling the pipe with overlap and permanent tension in the marker to grip the pipe firmly with the need of adhesives.

B. Provide markers on all new piping in the building. Wording of markers shall be as follows:

1. Chilled Water Supply - Chilled Water Return.
2. Refrigerant.
3. Condensate.
4. Make-Up Water.
5. All underground lines shall be marked with a bright colored continuous printed magnetic tape on top of the line.
6. Piping with heat trace cable shall have appropriate warning labels on insulation cover or protective aluminum jacket.

230534 NAMEPLATES

A. All new air handling units, VAV terminal boxes, chillers, split systems, heaters, power ventilators, and pumps shall be furnished with engraved plastic laminated labels permanently attached to the equipment. Lettering shall be ½" tall. Label shall include equipment number, area served, substantial completion date, number and size of filters, number and size of belts, and capacities. Substantial completion date shall be on a separate label so as to allow equipment nameplates to be installed prior to final acceptance.

B. Provide engraved plastic laminated or plastic tape label on ceiling grid below new or relocated VAV or fan powered terminal boxes and power ventilators located above ceilings. Label text shall match the piece of equipment's identifier/symbol noted on the drawings.

230535 EXCAVATION, TRENCHING AND BACKFILL

A. The Heating and Air Conditioning 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. 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 the Heating and Air Conditioning Contractor at his own expense. Should utility lines be encountered within the area of operations, the Heating and Air Conditioning Contractor shall notify the Architect in ample time for necessary measures to be taken to prevent interruption of service.

230536 CUTTING AND PATCHING

A. The Heating and Air Conditioning Contractor shall do all cutting and patching necessary to install all equipment as required under his 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 Engineer and be done by not the Heating and Air Conditioning Contractor, but shall be paid for by the Heating and Air Conditioning Contractor.

230537 DUCTWORK AND PIPING PRESSURE TESTING

A. The Heating and Air Conditioning Contractor shall make the following tests before the new systems are insulated or covered by construction. The new systems shall have no decrease in pressure during the test periods. All new and existing system components shall be protected from test pressures that exceed manufacturer's design limits.

B. Notify Architect and Engineer 48 hours in advance of all tests.

C. Heating and Air Conditioning Contractor shall provide written report of each test.

D. New chilled water piping shall be tested by applying a hydrostatic pressure of 1.5 times system's working pressure or 150-PSIG, whichever is greater but not exceeding the maximum pressure rating for any component in the system under test, for a period of four (4) hours. Chillers and existing shall be isolated during testing.

E. New refrigerant piping shall be tested in accordance with Chapter 11 of the North Carolina Mechanical Code and split system unit manufacturer's recommendations.

F. New condensate and make-up water piping shall be tested by applying a hydrostatic pressure of 100-psig for a period of two hours.

G. No caulking of joints shall be permitted. Any joint found to leak under this test shall be broken, remade, and a new test applied. Welded joint pinhole leaks shall be repaired by welding; however, welds that show numerous pinholes shall be replaced.

H. Duct Leakage Tests:

1. New supply air ducts between new air handling units and new VAV terminal boxes shall be leakage tested. VAV terminal boxes and ductwork downstream to diffusers, registers, and grilles are not required to be leakage tested.
2. Leakage testing shall be in accordance with SMACNA Duct Leakage Test Procedures – 1985.
3. The maximum permitted duct leakage shall be:

$$L_{max} = C_L P^{0.65}$$

where

L_{max} = maximum permitted leakage in cfm/100 ft^2 duct surface area;
C_L = duct leakage class, cfm/100 ft^2 at 1 in. w.c.
6 for rectangular sheetmetal, rectangular fibrous, and round flexible ducts,
3 for round/flat oval sheetmetal or fibrous glass ducts;
P = test pressure, which shall be equal to the design duct pressure class rating in in. w.c.

4. Heating and Air Conditioning Contractor shall document all tests with reports indicating duct sizes, observed/measured leakage, test apparatus with calibration data, etc. Test apparatus/ instrumentation shall have ranges and accuracies required to validate pressure/leakage test.
5. Heating and Air Conditioning Contractor shall provide modifications, repairs, and/or additional sealing as necessary to rectify duct leakage. Ductwork shall be re-tested until satisfactory.

230538 TESTING AND BALANCING

A. Testing and balancing of the new or renovated heating, ventilating, and air conditioning systems shall be performed by an AABC certified Test and Balance Company as a subcontractor to the Heating and Air Conditioning Contractor. All instruments used shall be accurately calibrated and in good working order. The tests shall be in strict accordance to the Standards of AABC. Test and Balance Contractor shall submit TAB plan to the Engineer for their review and approval prior to starting any TAB work.

B. Air balance and testing shall not begin until the systems have been installed in full working order and shown to be operating satisfactory on both heating and cooling. The Contractor shall place all heating, ventilating, and air conditioning systems into full operation and shall continue operation of the system until balancing is completed. All operational cost shall be borne by the Heating and Air Conditioning

Contractor. The Architect and Engineer shall be given three weeks advance notice of when tests are to be made.

C. Notify Architect, Engineer, and Brunswick County 48 hours in advance of testing and balancing so that there is the opportunity to witness.

D. Upon completion of the heating, ventilating, and air conditioning systems, the Test and Balance Contractor shall compile the test data and submit four copies of the completed test data to the Engineer for evaluation and approval. At final inspection and prior to final commissioning verification, Heating and Air Conditioning Contractor shall have a copy of test and balance report and all necessary personnel and equipment to facilitate spot-checking of test and balance data by the Engineer or his representative. Final payment to the Contractor shall be withheld until the complete test and balance data has been approved.

E. Testing Procedure (AIR):

1. Test and adjust air handling unit fan's RPM and CFM to design requirements. Record all data.
2. Test and record motor full load amperes on all motors.
3. Adjust all main supply, exhaust, return, relief, and outside air ducts to proper design CFM when air handling systems are in normal operating mode, DCV mode, and in outside air economizer mode. Record exhaust, relief, and outside air data.
4. Test and adjust each diffuser, grille, and register for supply, exhaust, or return systems to within 10% of design requirements. Record all data.
5. All adjustments to air diffusing devices where possible shall be made in trunk or run out dampers, not at diffuser volume control.
6. Exhaust fans shall be tested and balanced for the requirement as shown on the plans. Record all data.
7. The Heating and Air Conditioning Contractor shall make any changes in the pulleys, belts, filters, dampers, or valves necessary or as recommended by the Engineer for correct balance at no additional cost to the Owner.

F. Testing Procedure (VAV Terminal Boxes):

1. Adjust the room diffusers to the specified CFM with the box in the full cooling position. Check to see that the inlet damper is in the maximum cooling open position. Record all data.
2. After the specified air quantity has been verified in the maximum cooling position, adjust the inlet damper to achieve the minimum cooling CFM. Record all data.
3. After the specified air quantity has been verified in the cooling positions, adjust the inlet damper to achieve the maximum heating CFM. Record all data.

G. Required Capacity Test: To ensure that energy use is minimized, the new HVAC systems must be balanced at design conditions at the lowest possible static pressure possible. This requires that the lowest possible static pressure (SP) be found at the sensor that will allow full design flow at the TU most difficult to satisfy. This system minimum SP found is what the VSD should control to. This is accomplished by changing the temperature setpoint for all zones to 55F, causing all terminal units (TU) to be calling for full cooling. Each TU's airflow is then measured against the design flow. The TU that is receiving the lowest fraction of design is identified. The current SP at the controlling sensor is noted. A calculation is made, giving the SP required at the sensor to allow the identified most critical TU box to meet its design flow. The equation is $SP2=SP1 \times Q2^2/Q1^2$. Where Q1 = actual or fraction of design flow during capacity test. Q2 = design flow or 1.0 if using fractions.

SP1 = SP at sensor. SP2 = SP to control to. It is noted that if all boxes were calling for full cooling simultaneously, the fan could not maintain the new SP2 value, due to diversity fan size reduction having been made by the design engineer.

H. Testing Procedure (Water)

1. All air systems shall be balanced prior to water balance.
2. Open all valves to full open position.
3. Clean all strainers.

4. Set mixing valves to full coil flow.
5. Check expansion/compression tanks to determine that they are not air bound.
6. Check all air vents at high points of water systems to insure their installation and operation.
7. Set water system pumps to proper gallons per minute delivery. Record all data for each pump.
8. Check and record motor full load amperes.
9. Check and record coil inlet water temperature and air temperature drops or rises across coils for full cooling and full heating.
10. Test and adjust each fluid balancing item to within 5% of design requirements. Record all data.

230539 INSTRUCTIONS/TRAINING

A. The Heating and Air Conditioning Contractor shall give an instruction and training period in the operation of the new apparatus to the persons who will be in charge of the system. See Section 017900 for listing and training requirements.

230540 MAINTENANCE DATA

A. For all new or renovated items requiring maintenance, the Heating and Air Conditioning Contractor shall furnish two weeks prior to Final Acceptance and deliver to the Owner's representative on the job multiple copies of complete data as prepared by the manufacturer covering the details of operation and maintenance and complete parts list for all equipment specified. Each copy of the maintenance data shall be assembled into a 3-ring hardback binder with indexing and label on cover and spine. Data shall include:

1. Index with page numbers.
2. List of all subcontractors and suppliers with names, addresses, and phone numbers.
3. Contractor's certificate of Final Acceptance.
4. Copy of all warranties.
5. Equipment model numbers, etc. indicated and referenced with the same mark as shown on equipment on the drawings.
6. Filter schedules of sizes and quantities for all equipment requiring filters referenced by mark on the drawings.
7. Equipment summary showing all capacities and ratings.
8. Certified test and balance report.
9. Start-up and test reports for equipment.
10. Complete start-up, operation, and shut-down procedures for each system.
11. Lubrication schedules and types of lubricates.
12. All submittal data and shop drawings, unless included in a separate manual.
13. See Section 017823 for additional requirements.

230541 RECORD DRAWINGS

A. In accordance with Section 017839 Project Record documents, the Heating and Air Conditioning Contractor shall maintain "during the course of the work" a set of specifications and drawings marked up to show the new or renovated work as installed, **including a minimum of two dimensions to indicate locations and elevations of buried work**. Upon completion of the work, return this set of drawings to the Architect.

230542 GUARANTEE

A. The Heating and Air Conditioning Contractor shall guarantee the new or renovated portions of the heating and air conditioning system subject to the General Conditions of these specifications, except:

1. Refrigeration compressors for heat pump units and condensing units shall have a four-year extended warranty for the compressors only. Refrigerant, labor, freight, and other required parts shall be provided or paid for by the Owner.
2. See chiller specifications for chiller warranty requirements.

END OF SECTION 230500

SECTION 230900 - DIRECT DIGITAL CONTROL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Section 230500, Heating and Air Conditioning.

1.2 SUMMARY

A. This document contains the specification for a Building Automation System (BAS).

B. The system shall provide the Direct Digital Control (DDC), Energy Management and Building Automation System (BAS) for the air conditioning, heating and ventilating systems, lighting controls and shall interface with other microprocessor based building subsystems as shown on the drawings and as specified.

C. Refer to Division 1 for Alternates that may affect the Work of this Section.

D. As referred to in this specification, Contractor, Controls Contractor, Vendor, and BAS Contractor are the same Contractor.

1.3 SCOPE OF WORK

A. The Contractor shall furnish a complete, tested, fully integrated and completely operational Building Automation System including all necessary software and hardware, wiring, and control equipment in compliance with this Specification and the Construction Documents.

1.4 QUALITY ASSURANCE

A. The controls system vendor shall be responsible for the complete installation and proper operation of the control system. The vendor shall be in the regular and customary business of design, installation and service of computer-based building environmental control systems similar in size and complexity to the system specified. The vendor must be licensed as an “unlimited electrical contractor” in the state of North Carolina, shall have a factory-certified trainer on staff, and provide 5 day per week technical support.

B. Equipment and Materials shall be catalogued products of manufacturers regularly engaged in production and installation of HVAC control systems. Products shall be manufacturer's latest standard design and have been tested and proven in actual use.

C. The contractor shall provide hardware and software components of the same manufacturer wherever possible.

D. The contractor shall use standard off-the-shelf components and/or products whenever possible.

E. Install control devices in accessible location with reasonable working access. Coordinate all control device locations with other trade contractors. Contractor to report to A/E conditions that prevent reasonable accessibility.

F. Provide weather protection cover or weatherproof control devices where required for control devices located outdoors.

G. All control devices located outdoors shall be rated for the anticipated environment.

1.5 GUARANTEE PERIOD SERVICES

A. Maintenance of Control Hardware: The Contractor shall inspect, repair, replace, adjust, and calibrate, as required, the file server/workstation(s), associated peripheral equipment, and control units. The Contractor shall then furnish a report describing the status of the equipment, problem areas (if any) noticed during service work, and description of the corrective actions taken. The report shall clearly certify that all software is functioning correctly.

B. Maintenance of Control Software: The Contractor shall maintain all software. In addition, all factory or sub-vendor upgrades to software shall be added to the systems, when they become available, at no additional cost to the Owner.

C. Service Period: Routine system service shall be provided on a monthly basis for the first six (6) months of the guarantee period and at least every three months during the second six (6) months. Calls for service by the Owner shall be honored within 24 hours and are not to be considered as part of routine maintenance.

D. Service Documentation: A copy of the service report associated with each routine service visit or Owner-initiated service call shall be provided to the Owner and the A-E with 10 days after the date of each service call.

1.6 SUBMITTALS

A. General: Submittals shall demonstrate compliance with technical requirements by reference to each subsection of this specification. Where a submitted item does not **comply fully** with each and every requirement of the Specifications, the submittal shall clearly indicate such deviations.

B. Submittals required by this sub-section, and the required dates for each submittal, shall be finalized at a pre-submittal meeting, to be scheduled within 30 days of the date of the Notice to Proceed, and shall be provided in three phases:

1. Phase I submittals shall consist of DDC engineering shop drawings, including valve and damper schedules with sizing calculations, control system schematics, and sequences of operation, including setpoints, alarm limits, and schedules; product data for all control devices required under Section 230913; DDC system hardware and software as required below; and any other submittals determined during the pre-submittal conference. Phase I submittals must be submitted and reviewed as early in project schedule as possible to avoid delays in actual installation.
2. Phase II submittals shall consist of the graphic displays as required below. Phase II submittals are required at least 30 days prior to the date of the Substantial Completion inspection.
3. Phase III submittals shall be the close-out submittals as required below. Phase III submittals are required before the date of Final Completion inspection.

C. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.

D. DDC System Hardware: Bill of materials of equipment indicating quantity, manufacturer, and model number. Include technical data for operator workstation equipment, interface equipment, control units, transducers/transmitters, sensors, actuators, valves, relays/switches, control panels, and operator interface equipment.

E. DDC System Software:

1. Include technical data for operating system software, operator interface, color graphics, and other third-party applications.
2. List of graphics indicating monitored systems, data (connected and calculated) point addresses, output schedule, and operator notations.

F. Controlled Systems: Instrumentation list with element name, type of device, manufacturer, model number, and product data. Include written description of sequence of operation including schematic diagram.

G. Shop Drawings:

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Bill of materials of equipment indicating quantity, manufacturer, and model number.
3. Schematic diagrams of each controlled system with control points labeled and control elements graphically shown, with wiring.
4. Details of control panel faces, including controls, instruments, and labeling.
5. Written description of sequences of operation.
6. Schedule of dampers including size, leakage, and flow characteristics.
7. Schedule of valves including flow characteristics.
8. DDC System Hardware:

a. Wiring diagrams for control units with termination numbers.
b. Schematic diagrams and floor plans for field sensors and control hardware.
c. Schematic diagrams for control, communication, and power wiring, showing trunk data conductors and wiring between operator workstation and control unit locations.
d. Scaled drawings showing mounting, routing, and wiring of elements including bases and special construction.

H. Graphic Displays: Include color prints or "screen shots" of each proposed graphic display proposed, complete with clear indication of (1) static components and dynamic components and (2) "on"/"off"/"alarm" condition designation convention.

I. Samples for Initial Selection: For each color available for each type of thermostat, sensor, etc. cover exposed to view with factory-applied color finishes.

J. Closeout Submittals:

1. Operation and Maintenance Data: Include the following:

a. Maintenance instructions and lists of spare parts for each type of control device and compressed-air station.
b. Interconnection wiring diagrams with identified and numbered system components and devices.
c. Keyboard illustrations and step-by-step procedures indexed for each operator function.
d. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
e. Calibration records and list of set points.
f. Software and Firmware Operational Documentation: Include the following:

1) Software operating and upgrade manuals.
2) Program Software Backup: On a magnetic media or compact disc, complete with data files.
3) Device address list.
4) Printout of software application and graphic screens.
5) Software license.

PART 2 - PRODUCTS

2.1 GENERAL DESCRIPTION

A. Existing BAS in the Building is Trane Tracer SC+.

B. This specification covers renovated and/or new connection(s) to the existing BAS system.

C. BAS shall be Trane Tracer SC+ BACnet as an extension of the existing Trane Tracer SC+ system with 100% compatibility and functionality to view, command, trend and schedule the newly installed and existing equipment from the existing system interface(s). Provide all necessary gateways, controls,

updated software, etc. for a fully functional system that fully communicates and integrates with the existing Trane Tracer SC+ system.

D. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, accessories, and software connected by a communication network to distributed processing, standalone control units operating in a multiuser, multitasking environment and programmed to control HVAC and other systems, as shown on the Drawings.

2.2 ARCHITECTURE/COMMUNICATION

A. System shall be comprised of a high speed Ethernet network utilizing BACnet/IP communications between System Controllers capable of communicating with the existing Trane Tracer SC+ Building controller. Communications between System Controllers and sub-networks of Custom Application Controllers and/or Application Specific Controllers shall utilize BACnet/MSTP (RS485) or BACnet/Zigbee.

1. The System Controller shall perform communications to a network of new and existing Custom Application and Application Specific Controllers using BACnet/Zigbee (802.15.4) as defined by the Zigbee Standard.
    a. Each communication interface shall be Zigbee Building Automation Certified product as defined by the BACnet Standard and the Zigbee Alliance.
    b. Each System Controller shall function as a BACnet Router to each unit controller providing a unique BACnet Device ID for all controllers within the system.
2. The Owner will provide all communication media, connectors, repeaters, network switches, and routers necessary for the high speed Ethernet network. An active Ethernet port is existing and the Trane System Controller is existing.
3. All values within the system – contained in both the system and unit controllers - (i.e. Schedules, Data Logs, Points, Application Variables, Custom Program Variables) shall be readable and controllable (where appropriate) by any System Controller or BACnet Workstation on the communications network via BACnet.

2.3 OPERATOR INTERFACE

A. A dedicated PC is not required to access the operator interface.

1. Operator Interface:
    a. The operator interface shall be accessible via a web browser without requiring any “plug-ins” (i.e. JAVA Runtime Environment (JRE), Adobe Flash).
    b. The operator interface shall support the following Internet web browsers:
        1) Internet Explorer 11.0+
        2) Firefox latest version
        3) Chrome latest version
    c. The operator interface shall support the following mobile web browsers:
        1) iOS (iPad/iPhone) 8, 9 +
        2) Android (Tablet) V4.4+
        3) Android (Phone) V4.4+
2. System Security:
    a. Each operator shall be required to login to the system with a user name and password in order to view, edit, add, or delete data.
    b. User Profiles shall restrict the user to only the objects, applications, and system functions as assigned by the system administrator.
    c. Each operator shall be allowed to change their user password
    d. The System Administrator shall be able to manage the security for all other users
    e. The system shall include pre-defined “roles” that allow a system administrator to quickly assign permissions to a user.

f. User logon/logoff attempts shall be recorded.
g. The system shall protect itself from unauthorized use by automatically logging off following the last keystroke. The delay time shall be user definable.
h. All system security data shall be stored in an encrypted format.

3. Database:

a. Database Save. A system operator with the proper password clearance shall be able to archive the database on the designated operator interface PC.
b. Database Restore. The system operator shall also be able to clear a panel database and manually initiate a download of a specified database to any panel in the system.

4. On-Line Help and Training:

a. Provide a context sensitive, on line help system to assist the operator in operation and configuration of the system.
b. On-line help shall be available for all system functions and shall provide the relevant data for each particular screen.

5. System Diagnostics:

a. The system shall automatically monitor the operation of all network connections, building management panels, and controllers.
b. The failure of any device shall be annunciated to the operators.

6. Equipment and Application Pages:

a. The operator interface shall include standard pages for all equipment and applications. These pages shall allow an operator to obtain information relevant to the operation of the equipment and/or application, including:

1) Animated Equipment Graphics for each major piece of equipment and floor plan in the System. This includes:

a) Each Chiller, Air Handler, VAV Terminal, Fan Coil, Boiler, and Cooling Tower. These graphics shall show all points dynamically as specified in the points list.
b) Animation capabilities shall include the ability to show a sequence of images reflecting the position of analog outputs, such as valve or damper positions. Graphics shall be capable of launching other web pages.

2) Alarms relevant to the equipment or application without requiring a user to navigate to an alarm page and perform a filter.
3) Historical Data (As defined in Data Log section below) for the equipment or application without requiring a user to navigate to a Data Log page and perform a filter.

7. **BAS graphics shall be in accordance with Brunswick County's standards.**

8. System Graphics: Operator interface shall be graphically based and shall include at least one graphic per piece of equipment or occupied zone, graphics for each chilled water and hot water system, and graphics that summarize conditions on each floor of each building included in this contract. Indicate thermal comfort on floor plan summary graphics using colors to represent zone temperature relative to zone set point.

a. Functionality: Graphics shall allow operator to monitor system status, to view a summary of the most important data for each controlled zone or piece of equipment, to use point and-click navigation between zones or equipment, and to edit set points and other specified parameters.
b. Graphic Imagery: Graphics shall use 3D images for all standard and custom graphics. The only allowable exceptions will be photo images, maps, schematic drawings, and selected floor plans.
c. Animation: Graphics shall be able to animate by displaying different Image lies for changed object status.

d. Alarm Indication: Indicate areas or equipment in an alarm condition using color or other visual indicator.
e. Format: Graphics shall be saved in an industry-standard format such as BMP, JPEG, PNG, or GIF. Web-based system graphics shall be viewable on browsers compatible with World Wide Web Consortium browser standards. Web graphic format shall require no plug-in (such as HTML and JavaScript) or shall only require widely available no-cost plug-ins (such as Active-X and Macromedia Flash).

9. Custom Graphics:

a. The operator interface shall be capable of displaying custom graphics in order to convey the status of the facility to its operators.
b. Graphical Navigation: The operator interface shall provide dynamic color graphics of building areas, systems and equipment.
c. Graphical Data Visualization: The operator interface shall support dynamic points including analog and binary values, dynamic text, static text, and animation files.
d. Custom Background Images: Custom background images shall be created with the use of commonly available graphics packages such as Adobe Photoshop. The graphics generation package shall create and modify graphics that are saved in industry standard formats such as GIF and JPEG.

10. Graphics Library: Furnish a library of standard HVAC equipment such as chillers, air handlers, terminals, fan coils, unit ventilators, rooftop units, and VAV boxes, in 3-dimensional graphic depictions. The library shall be furnished in a file format compatible with the graphics generation package program.
11. Manual Control and Override:

a. Point Control: Provide a method for a user to view, override, and edit if applicable, the status of any object and property in the system. The point status shall be available by menu, on graphics or through custom programs.
b. Temporary Overrides: The user shall be able to perform a temporary override wherever an override is allowed, automatically removing the override after a specified period of time.
c. Override Owners: The system shall convey to the user the owner of each override for all priorities that an override exists.
d. Provide a specific icon to show timed override or operator override, when a point, unit controller or application has been overridden manually.

12. Engineering Units:

a. Allow for selection of the desired engineering units (i.e. Inch pound or SI) in the system.
b. Unit selection shall be able to be customized by locality to select the desired units for each measurement.
c. Engineering units on this project shall be [Option 1] IP [Option 2] SI.

13. Scheduling: A user shall be able to perform the following tasks utilizing the operator interface:

a. Create a new schedule, defining the default values, events and membership.
b. Create exceptions to a schedule for any given day.
c. Apply an exception that spans a single day or multiple days.
d. View a schedule by day, week and month.
e. Exception schedules and holidays shall be shown clearly on the calendar.
f. Modify the schedule events, members and exceptions.

14. Data Logs:

a. Data Logs Definition:

1) The operator interface shall allow a user with the appropriate security permissions to define a Data Log for any data in the system.
2) The operator interface shall allow a user to define any Data Log options as described in the Application and Control Software section.

b. Data Log Viewer:

1) The operator interface shall allow Data Log data to be viewed and printed.
2) The operator interface shall allow a user to view Data Log data in a text-based format (time –stamp/value).
3) The operator shall be able to view the data collected by a Data Log in a graphical chart in the operator interface.
4) Data Log viewing capabilities shall include the ability to show a minimum of 5 points on a chart.
5) Each data point data line shall be displayed as a unique color.
6) The operator shall be able to specify the duration of historical data to view by scrolling and zooming.
7) The system shall provide a graphical trace display of the associated time stamp and value for any selected point along the x-axis.

c. Export Data Logs:

1) The operator interface shall allow a user to export Data Log data in CSV or PDF format for use by other industry standard word processing and spreadsheet packages.

15. Alarm/Event Notification:

a. An operator shall be notified of new alarms/events as they occur while navigating through any part of the system via an alarm icon.
b. Alarm/Event Log: The operator shall be able to view all logged system alarms/events from any operator interface.

1) The operator shall be able to sort and filter alarms from events. Alarms shall be sorted in a minimum of 4 categories based on severity.
2) Alarm/event messages shall use full language, easily recognized descriptors.
3) An operator with the proper security level may acknowledge and clear alarms/events.
4) All alarms/events that have not been cleared by the operator shall be stored by the building controller.
5) The alarm/event log shall include a comment field for each alarm/event that allows a user to add specific comments associated with any alarm.

c. Alarm Processing:

1) The operator shall be able to configure any object in the system to generate an alarm when transitioning in and out of a normal state.
2) The operator shall be able to configure the alarm limits, warning limits, states, and reactions for each object in the system.

16. Reports and Logs:

a. The operator interface shall provide a reporting package that allows the operator to select reports.
b. The operator interface shall provide the ability to schedule reports to run at specified intervals of time.
c. The operator interface shall allow a user to export reports and logs from the building controller in a format that is readily accessible by other standard software applications including spreadsheets and word processing. Acceptable formats include:

1) CSV, HTML, XML, PDF

d. Reports and logs shall be readily printed to the system printer.
e. Provide a means to list and access the last 10 reports viewed by the user.
f. The following standard reports shall be available without requiring a user to manually configure the report:

1) All Points in Alarm Report: Provide an on demand report showing all current alarms.
2) All Points in Override Report: Provide an on demand report showing all overrides in effect.
3) Commissioning Report: Provide a one-time report that lists all equipment with the unit configuration and present operation.

4) Points report: Provide a report that lists the current value of all points
5) ASHRAE Standard 147 Report: Provide a daily report that shows the operating condition of each chiller as required by ASHRAE Standard 147. At minimum this report shall include:

a) Chilled Water (or other fluid) inlet and outlet temperature
b) Chilled Water (or other fluid) flow
c) Chilled Water (or other fluid) inlet and outlet pressures
d) Evaporator refrigerant pressure and temperature
e) Condenser refrigerant pressure and liquid temperature
f) Condenser water inlet and outlet temperatures
g) Condenser water flow
h) Oil pressure and temperature
i) Oil level (if applicable)
j) Compressor refrigerant discharge temperature
k) Compressor refrigerant suction temperature
l) Manual entry field for addition of refrigerant
m) Manual entry field for addition of oil
n) Manual entry field for vibration levels
o) Motor amperes per phase
p) Motor volts per phase
q) Purge exhaust time or discharge count
r) Ambient temperatures (dry bulb and wet bulb)
s) Date and time Data Logged

17. VAV Air System. An operator shall be able to view and control (where applicable) the following parameters via the operator interface:

a. System Mode
b. System Occupancy
c. Ventilation (Outdoor air flow) setpoint
d. Ventilation (Outdoor air flow) status
e. Air Handler Static pressure setpoint
f. Air Handler Static pressure status
g. Air Handler occupancy status
h. Air Handler Supply air cooling and heating set points
i. Air Handler minimum, maximum and nominal static pressure setpoints
j. VAV box minimum and maximum flow
k. VAV box drive open and close overrides
l. VAV box occupancy status
m. VAV box Airflow to space
n. Average space temperature
o. Minimum space temperature
p. Maximum space temperature

2.4 APPLICATION AND CONTROL SOFTWARE

A. Furnish the following applications software for building and energy management. All software applications shall reside and run in the system controllers. Editing of applications shall occur at the operator interface.

1. Scheduling: Provide the capability to schedule each object or group of objects in the system. Each of these schedules shall include the capability for start, stop, optimal start, optimal stop, and night economizer actions. Each schedule may consist of up to [10] events. When a group of objects are scheduled together, provide the capability to define advances and delays for each member. Each schedule shall consist of the following:

a. Weekly Schedule: Provide separate schedules for each day of the week.
b. Exception Schedules: Provide the ability for the operator to designate any day of the year as an exception schedule. This exception schedule shall override the standard schedule for that

day. Exception schedules may be defined up to a year in advance. Once an exception schedule is executed it will be discarded and replaced by the standard schedule for that day of the week.

c. Holiday Schedules: Provide the capability for the operator to define up to 99 special or holiday schedules. These schedules may be placed on the scheduling calendar and will be repeated each year. The operator shall be able to define the length of each holiday period.

d. Optimal Start: The scheduling application outlined above shall support an optimal start algorithm. This shall calculate the thermal characteristics of a zone and start the equipment prior to occupancy to achieve the desired space temperature at the specified occupancy time. The algorithm shall calculate separate sets of heating and cooling rates for zones that have been unoccupied for less then and greater than 24 hours. Provide the ability to modify the start algorithm based on outdoor air temperature. Provide an early start limit in minutes to prevent the system from starting before an operator determined time limit.

2. Data Log Application:

a. Data Log data shall be sampled and stored on the System Controller panel and shall be capable of being archived to a BACnet Workstation for longer term storage.

1) Data Log sample types shall include interval, start-time, and stop-time.
2) Data Log intervals shall be configurable as frequently as 1 minute and as infrequently as 1 year.

b. Data Logs:

1) The system controller shall contain Data Log information for defined key measurements for each controlled HVAC device and HVAC application.
2) The Data Logs shall monitor these parameters for a minimum of 7 days at 15 minute intervals. The Data Logs intervals shall be user adjustable.
3) The following is a list of key measurements required to be data logged:

a) Air Systems:

Air Handling Unit/Rooftop (VAV)	Discharge Air Temperature
	Discharge Air Temperature Setpoint Active
	Space Temperature Active
	Cooling Capacity Status
	Discharge Air Flow

Air Handling Unit/Rooftop (CV)	Discharge Air Temperature
	Space Temperature Active
	Space Temperature Setpoint Active
	Cooling Capacity Status
	Heating Capacity Primary Status
	Outdoor Air Damper Position

VAV Box	Discharge Air Temperature
	Space Temperature Active
	Space Temperature Setpoint Active
	Air Flow Setpoint Active
	Discharge Air Flow

Variable Air System (Application)	Duct Static Optimization Duct Static Setpoint
	Space Temperature Average
	Ventilation Optimization Air Setpoint
	Operating Mode
	Duct Pressure Optimization Maximum

b) Chilled Water Systems:

Chiller	Active Cool/Heat Setpoint Temperature
	Actual Running Capacity
	Condenser Saturated Refrigerant Temperature Circuit 1
	Condenser Saturated Refrigerant Temperature Circuit 2
	Evaporator Leaving Water Temperature

c) Area:

Area	Active Setpoint
	Heat/Cool Mode Status
	Space Temperature Average
	Space Maximum Temperature
	Space Minimum Temperature
	Space Temperature Sensor

3. Alarm/Event Log:
   a. Any object in the system shall be configurable to generate an alarm when transitioning in and out of a normal or fault state.
   b. Any object in the system shall allow the alarm limits, warning limits, states, and reactions to be configured for each object in the system.
   c. An alarm/event shall be capable of triggering any of the following actions:
      1) Route the alarm/event to one or more alarm log
         a) The alarm message shall include the name of the alarm location, the device that generated the alarm, and the alarm message itself.
      2) Route an e-mail message to an operator(s)
      3) Log a data point(s) for a period of time
      4) Run a custom control program
4. VAV System Coordination. Provide applications software to properly coordinate and control the VAV system to ensure equipment safety and minimize energy use. This application shall perform the following functions:
5. Startup and shutdown the air handler safely. Ensure the VAV boxes are open sufficiently when the air handler is running, to prevent damage to the ductwork and VAV boxes due to high air pressure.
   a. Calibrate VAV boxes.
   b. Fan Pressure Optimization (ASHRAE 90.1) - Minimize energy usage by controlling system static pressure to the lowest level while maintaining zone airflow requirements. System static pressure controlled to keep the “most open” zone damper between 65% and 75% open.
      1) The Fan Pressure Optimization application shall have the ability to identify and display the discharge air setpoint of the air-handler and the VAV box that serves the critical zone (e.g., the zone with the most open VAV box damper). This information shall dynamically update with changes in the location of the critical zone.

2) During commissioning, and with the engineer/owner, the controls contractor shall confirm the performance of Fan Pressure Optimization by conducting a field functional test that demonstrates critical zone reset.

c. Ventilation Optimization (ASHRAE 62) – properly ventilate all spaces while minimizing operating energy costs, using measured outdoor air flow. Dynamically calculate the system outdoor air requirement based on "real time" conditions in the spaces (i.e., number of occupants, CO2 levels, etc.) minimizing the amount of unconditioned outdoor air that must be brought into the building.

d. Demand Controlled Ventilation – the active ventilation setpoint shall modulate between the occupied ventilation and occupied standby ventilation setpoint; Reset the setpoint based on CO2 levels in the space.

2.5 SYSTEM CONTROLLERS

A. There shall be one or more independent, standalone microprocessor based System Controllers to manage the global strategies described in Application and Control Software section.

1. The System Controller shall have sufficient memory to support its operating system, database, and programming requirements.
2. The controller shall provide a USB communications port for connection to a PC
3. The operating system of the Controller shall manage the input and output communications signals to allow distributed controllers to share real and virtual point information and allow central monitoring and alarms.
4. All System Controllers shall have a real time clock.
5. Data shall be shared between networked System Controllers.
6. The System Controller shall continually check the status of its processor and memory circuits. If an abnormal operation is detected, the controller shall:
   a. Assume a predetermined failure mode.
   b. Generate an alarm notification.
   c. Create a retrievable file of the state of all applicable memory locations at the time of the failure.
   d. Automatically reset the System Controller to return to a normal operating mode.
7. Environment: Controller hardware shall be suitable for the anticipated ambient conditions. Controller used in conditioned ambient shall be mounted in an enclosure, and shall be rated for operation at -40 C to 50 C [-40 F to 122 F].
8. Clock Synchronization.
   a. All System Controllers shall be able to synchronize with a NTP server for automatic time synchronization.
   b. All System Controllers shall be able to accept a BACnet time synchronization command for automatic time synchronization.
   c. All System Controllers shall automatically adjust for daylight savings time if applicable.
9. Serviceability:
   a. Provide diagnostic LEDs for power, communications, and processor.
   b. The System Controller shall have a display on the main board that indicates the current operating mode of the controller.
   c. All wiring connections shall be made to field removable, modular terminal connectors.
   d. The System controller shall utilize standard DIN mounting methods for installation and replacement.
10. The System Controller shall maintain all BIOS and programming information indefinitely without power to the System controller.
11. Immunity to power and noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perf rm an orderly shut-down below 80% nominal voltage
12. BACnet Test Labs (BTL) Listing. Each System Controller shall be listed as a Building Controller (B-BC) by the BACnet Test Labs with a minimum BACnet Protocol Revision of 14.

2.6 PROGRAMMABLE CONTROLLERS

A. Air-Fi™ Wireless Communication Interface -The Air-Fi™ Wireless Communications Interface (WCI) enables wireless communications between system controls, unit controls, and wireless sensors for Trane control products that use the BACnet® protocol. The WCI replaces the need for communications wire in all system applications.

B. The Air-Fi™ Wireless Communications Sensor (WCS) is compatible with any Trane controller that uses a WCI, except the Tracer SC. No further software or hardware is necessary for site evaluation, installation, or maintenance. Space temperature is standard on all models. (A service tool cannot be connected to a Trane wireless sensor.)

2.7 REMOTE ACCESS

A. Use Brady BIS, a pre-engineered secure technology.

2.8 FIELD HARDWARE/INSTRUMENTATION

A. Provide all remote sensing points and instrumentation as required for the systems. All sensors shall have accuracies as stated.

B. Field Wiring: For each digital device shall be two or three conductor No. 22 AWG, or larger twisted sets of copper conductors 300 volts, thermoplastic. When line voltage is present in conduits or wiring trays the insulation on all conductors shall be 600 volts. For multi-conductor wire having four or more conductors, wire size shall be not less than No. 20 AWG solid copper. Concealed accessible wiring may be installed as properly supported cable. Provide protective sleeves at wall and floor penetrations. Concealed inaccessible locations and mechanical rooms shall have wiring installed in properly sized, blue colored conduit.

C. Safety/Status Switches:

1. Snap action SPDT switches shall operate from a neoprene slack diaphragm, corrosion-resistant stainless steel diaphragm or copper diaphragm capable of being adjusted through the total pressure range. Switches shall withstand at least twice the working pressure of the system including any standing head, and have a temperature range exceeding the worst case liquid and ambient temperature range conditions. Provide a NEMA 4 enclosure for the switch assembly. For ease of service and maintenance, install the switch with a 3 valve manifold piped in copper to pressure taps in the liquid lines.
2. Current sensing relay shall be used for pump motor status. The current sensing relay shall be adjustable within three ranges; .1-6amps, 6-40amps and 40-200amps. Contact rating shall be .15amps at 30VDC.
3. Differential air pressure switches shall be piped in parallel across fans for positive indication of flow. Static pressure sensing tips shall be used for both high and low inputs. Pressure range shall be adjustable between .07 and 1.0" W.C. Snap acting contact shall be rated at 300 VA at 120 VAC.

D. Temperature Sensor:

1. Stem or tip sensitive types.
2. Sensing elements shall be hermetically sealed.
3. Stem and tip construction shall be 304 stainless steel.
4. All external trim material shall be corrosion resistant designed for the intended application.
5. Thermometer wells shall be stainless steel. Heat transfer compounds shall be compatible with the sensors. All piping system sensors shall be installed in thermowells.

E. Sensor Accuracy - Sensors are only one element in the overall system accuracy to which the CU can respond. That response includes alarm decision, value display, value calculation on which analog values must be multiplied, subtracted, square rooted, etc. As such, the system end-to-end accuracies are herein stated. The following range/ accuracies are required:

± .5 for the air temperatures.
± 1.0 for water temperatures.
± 0.5 for water temperatures in the range 40 - 55 F.
KWH and KW monitoring within 1.0% of full scale value.
± 2.0 psig for water or steam pressure in the range of 0 - 200 psig.
± 1.0% of full scale value for potential or current transducers.
± 3.0% for 0-100% RH.

Sensors for differential temperature readings to be used in BTU calculations shall be a matched pair with a differential accuracy of plus or minus 0.1 degrees F.

F. Temperature Devices:

1. Type & Accuracy: Temperature sensors shall be of the type and accuracy indicated for the application. Sensors shall have an accuracy rating within 1% of the intended use temperature range.
2. Mixed Air Application: Sensors used for mixed air applications shall be the averaging type and have an accuracy of +1°F. (0.5°C). Sensors shall be of adequate length to accurately measure average temperature of coil or plenum area.
3. Outside Air Temperature Sensors: Outside air temperature sensors accuracy shall be within +1°F. (0.5°C.). Minimum operating span shall -50°F. to 150°F. Outside Air Temperature and Humidity Sensors (separate devices) shall be mounted in the outdoors where natural air flow occurs, away from any artificial affect from mechanical sources. The humidity sensor span shall be 0 – 100% RH. The sensors shall be independent devices, designed for exterior application; provide all required shielding.
4. Duct Temperature Sensors shall have an insertion measuring probe 6 inches long with a temperature range of -40 to 250 degrees F. The sensor shall include a utility box and gasket to prevent air leakage and vibration noise. For all mixed air and coil discharge air applications, install bendable averaging duct sensors with a minimum 5 foot long sensor element. Element shall provide adequate coil coverage.
5. Liquid Immersion Temperature Sensors shall have a temperature range of -40 to 250 degrees F.
6. Room Temperature Sensors: Temperature sensors shall have an accuracy of $\pm$1.0°F with minimum operating span of 45°F. to 95°F. The corridor sensor shall be stainless steel plate with a thermistor thermally bonded to back, with fully insulated gasket. Room sensors shall have no digital display of room temperature or setpoint, but shall have setpoint adjustment, integrated occupancy sensor where applicable, and push button override with status indicator.
7. Chilled Water Sensors: Chilled water and condenser water sensors shall have an accuracy of ±1.0°F. in their range of application. Minimum operating span shall be 0°F. to 125°F. Sensors shall be installed in stainless steel sensor wells.

G. Pressure Instruments:

1. Differential Pressure and Pressure Sensors: Air pressure transmitter shall universally measure very low static or differential pressure using a variable capacitance technique. Static pressure shall measure in ranges from 0 to 10 inches water column. Operating pressure span and either unidirectional or bidirectional measurement shall be field selectable. Transmitter accuracy, including non-linearity, hysteresis and non-repeatability shall be within 1% of full scale. Pressure transducers shall have LCD display.
2. Pressure Switches: Snap action SPDT switches shall operate from a neoprene slack diaphragm, corrosion resistant stainless steel diaphragm or copper diaphragm capable of being adjusted through the total pressure range. Switches shall withstand at least twice the working pressure of the system including any standing head, and have a temperature range exceeding the worst case liquid and ambient temperature range conditions.
3. Air pressure transmitter shall universally measure very low static or differential pressure using a variable capacitance technique. Static pressure shall measure in ranges from 0 to 10 inches water column. Operating pressure span and either unidirectional or bidirectional measurement shall be field selectable. Transmitter accuracy, including non-linearity, hysteresis and non-repeatability shall be within 1% of full scale. Pressure transducers shall have LCD display.

4. Flow Switches: Differential-pressure Venturi-type designed for installation in piping. Actuating flow rated shall be field adjustable for the specified and indicated service. Switch location shall preclude exposure to turbulent or pulsating flow conditions. Where possible, install in a straight run of pipe at least 15 diameters in length to minimize false indications. Flow switch shall not cause pressure drop exceeding 2 psid at maximum system flow rate.
5. Status Switches: Current sensing relay shall be used for pump motor status. The current sensing relay shall be adjustable within three ranges; 0.1 - 6 amps, 6 – 40 amps, and 40 – 200 amps. Contact rating shall be 0.15 amps at 30 VDC.

H. Humidity Instruments:

1. Duct Relative Humidity Sensors shall be duct-mounted devices that produce a linear output over the complete range of 0-100% RH. A thin film polymer sensing element shall respond quickly to changes in humidity and shall be protected from contamination by a sintered filter. The sensor shall be factory calibrated with periodic field recalibration capability. The sensor shall be mounted in a duct probe assembly and be installed only after the construction or renovation area is free of contamination.
2. Space Relative Humidity Sensors: The sensor shall be an analog precision capacitance type relative humidity detector. Sensing element shall be rated for the relative humidity range 0-100%.

I. Air Flow Monitoring Stations: Unless otherwise noted, monitor outdoor air volumes from duct mounted thermal dispersion air flow measurement systems. System shall employ bead in glass thermistor technology. Sensors shall be installed using an equal area sensor distribution. Thermistor signals shall be process by a 12 bit microprocessor based transmitter. Transmitter shall be 24vac powered. System shall be capable of processing any air flow rate from 0 to 5000FPM. Sensor accuracy shall be +/- 2% of reading with a +/- .25% repeatability. Sensors shall operate in conditions of -20˚ F to 160˚ F and 0 to 90% RH, non-condensing. Where indicated provide Air Flow Monitoring Station equal to Ebtron with remote indicating readout panels. Install readout panels a maximum of 6’-0” above the finished floor in the closest Mechanical Room.

J. Water Flow Metering – Hydronic heating and cooling: Provide water flow meters equal to Onicon F-1210 Dual Turbine.

K. Water Differential Pressure Sensor:

1. Sensor shall have three switch selectable ranges: (5, 10, 25, 50).
2. Sensor shall have test mode to produce full-scale output automatically.
3. Sensor shall have provision for zeroing by pushbutton or digital input.
4. Sensor shall have field selectable outputs of 0-5v, 0-10v, and 4-20ma.
5. Sensor shall have two pressure sensors.
6. Sensor shall operate from 24vdc or 24vac. (AC power applies to operation in voltage mode only).
7. Sensor housing shall be powder-coated steel.
8. Sensor shall have NEMA 4 rating.
9. Sensor shall have a port swap feature.
10. Sensor accuracy shall be +/-1% FS combined linearity, hysteresis, and repeatability.
11. Sensor overpressure ratings shall be 2x max. FS range proof and 5x max. FS range burst.
12. Sensor shall be provided with LCD display.
13. Provide pressure differential transmitter equal to Veris PWL-N-04 with Kele BVA enclosure. Provide pressure gauge upstream and downstream of transmitter.

L. Output Devices:

1. Control Relays.
2. Solid State Relays (SSR).

M. Valve and Damper Actuators:

1. Basis of design: Belimo.
2. Electronic Direct-Coupled. Electronic direct-coupled actuation shall be provided.

3. Actuator Mounting. The actuator shall be direct-coupled over the shaft, enabling it to be mounted directly to the damper shaft. Where a shaft extension is required a manufactured option accessory shall be used. Field fabricated extensions and couplers will not be allowed. The actuator shall employ a V-bolt and toothed V-clamp fastening technique. Single point bolt or screw type fastener for circular valve and damper shafts is unacceptable.
4. Electronic Overload Sensing. The actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the entire rotation of the actuator. Mechanical end switches or magnetic clutch to deactivate the actuator at the end of rotation are not acceptable.
5. Power Failure/Safety Applications. For power failure/safety applications, an internal mechanical spring return mechanism shall be built into the actuator housing. Non-mechanical forms of fail-safe operation are not acceptable.
6. Spring Return Actuators. All spring return actuators shall be capable of both clockwise and counterclockwise spring return operation by simply changing the mounting orientation.
7. Proportional Actuators. Proportional actuators shall accept a 0 to 10VDC or 0 to 20mA control input and provide a 2 to 10VDC or 4 to 20mA operating range. An actuator capable of accepting a pulse width modulating control signal and providing full proportional operation of the damper is not acceptable.
8. 24 Volts (AC/DC) actuators. All 24VAC/DC actuators shall operate on Class 2 wiring and shall not require more than 20VA for AC or more than 8 watts for DC applications. Actuators operating on 120VAC power shall not require more than 20VA. Actuators operating on 230VAC shall not be acceptable.
9. Non-Spring Return Actuators. All non-spring return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring return actuators shall have a manual crank for this purpose.
10. Modulating Actuators. All modulating actuators shall have an external, built-in switch to allow reversing direction of rotation.
11. Conduit Fitting. Actuators shall be provided with a conduit fitting.
12. U.L. Listing. Actuators shall be Underwriters Laboratories Standard 873 listed.
13. Warranty. Actuators shall be designed for a minimum of 60,000 full stroke cycles at the actuator's rated torque and shall have a minimum 5-year manufacturer's warranty.
14. Actuators shall be selected utilizing no more than 80% of the cataloged torque rating.
15. Actuators shall be electronic, low voltage (24 VAC/VDC), NEMA 2 rated for all applications. Two-position may utilize 120 VAC actuators. Actuators shall have UL, CSA and ISO 9001 certification and approvals. Actuators shall have a minimum operating range of –22° to 122°F. Optional auxiliary switches shall be available if required by the sequence. Actuators shall be fully modulating/proportional, floating/tri-state, or two-position as required. Pulse width modulation is unacceptable. Actuators shall have visual position indicators. Proportional actuators shall be field programmable to operate in sequence with other devices without additional transducers. All actuators except two-position shall be capable of providing a constant rotation rate independent of the load. Actuators used on dampers or valves shall be designed to directly couple to a stem, shaft or ISO style-mounting pad. Damper actuators or damper actuators adapted for use with control valves shall utilize V-bolt toothed V-clamp shaft fastening technique. Single point, bolt, or single screw type shaft fastening techniques for circular or round damper or valve shafts is unacceptable.

N. Valves: Controls contractor shall be responsible for selection of the proper control valves including line size, pressure rating, flow-coefficient, shutoff rating and allowable leakage factor. Valves 2 1/2 inches and larger shall have minimum 125 psig cast-iron body and shall have stainless steel stems and Flanged connections with field replaceable packing. Valves smaller than 2 1/2 inches shall be constructed of brass with screwed connections, stainless steel stems and field replaceable packing. Ball Valves 2” and less shall have forged brass or bronze bodies rated for a minimum 250 psi, bronze or reinforced Teflon®seats, equal percentage flow characteristics in 2-Way applications, liner or constant flow in 3-Way applications, a spring loaded Teflon®, EPDM or dual EPDM o-ring packing, and stainless steel or brass stems. Butterfly valves shall have a fully lugged, drilled and tapped, cast iron body. Flanges shall meet ANSI 125/150 standards. The one-piece body shall have an extended neck allowing clearance for flanges and piping insulation. The disc shall be stainless steel and provide bi-directional bubble-tight close off in either direction. The flow characteristic shall be modified equal percentage for 2-way and linear for 3-way

valves. Furnish a cartridge type, non-collapsing, EPDM seat. The disk shall have full 360-degree concentric seating. The shaft shall be supported at multiple (minimum three) locations. No gaskets shall be required between the valve and flange faces. Three-way butterfly valves shall utilize independent actuators for each valve body; connecting linkage is not acceptable.

O. Dampers: Control dampers shall be opposed blade (except where two-position action is indicated) with interlocking gasketed edges, jamb seals and ball type oilite bearings. Blades and frames shall have galvanized finish. Frames shall not be less than 5" X 1/2" X 16 gauge channel steel and shall be reinforced to form a rigid assembly. Blades shall be 16 gauge with maximum blade width of 10". All outside air and relief/exhaust air dampers shall be spring return normally closed and have independent control.

Dampers over four feet high or wide, or over 16 sq. ft. shall be built in two or more sections with interconnections on every other blade. Gasket material shall be molded neoprene or approved equal. Damper leakage shall not exceed 6.0 CFM/SF at 1" SP, fully closed. Damper shall be installed with damper shafts in horizontal plane, unless supplied with bearing rated for vertical thrust.

P. Variable Volume Terminal Control Unit: Provide PID control for damper and valve control. The Room Sensor for VAV terminal units shall have no digital display of room temperature or set-point, but shall have set-point adjustment, integrated occupancy sensor where applicable, and push button override with status indicator. The VAV terminal unit discharge sensor shall be an insertion type probe.

Q. Variable Frequency Drives shall have voltage vector control, soft switching technology, automatic energy optimization, full English multi-line operators panel with backlit display and keypad and hand/off/auto function, manufacturer's standard 36-month warranty, built-in line reactors for harmonic mitigation, main power disconnect with fusing, drive disconnect, isolation barriers inside cabinet, and under voltage/single phase protection. Drive shall send alarm signal to DDC control system in the event of drive failure.

1. **Drives shall be by the BAS Contractor.**
2. **Control wiring between DDC system and the drives shall be by the BAS Contractor.**
3. Disconnects in drives shall be capable of being padlocked in the off position.
4. Motors greater than 10 HP with drives will have shaft grounding rings.
5. For dual fan or fan array application, motors shall be connected to a single VFD.
6. Controls and interface to BAS shall be in accordance with this Section.
7. **Basis of design for drives is ABB.**
8. Mount drives on walls or support systems in the spaces, not on the equipment.
9. Variable frequency drives shall have manufacturer's three-year warranty.

R. Mylar labels shall be provided to identify all control components and points of connection.

2.9 UTILITY METERING

A. Electrical demand shall be from pulsing dry contacts provided by Owner and installed by the Utility Company at the power meter. The DDC system shall be capable of measuring and scaling any pulse rate provided by the Utility Company.

B. VFD sub-metering shall be monitored and measured by way of the BACnet output of the VFD.

C. For buildings that have multiple meters such as electrical sub meters, VFD meters, etc., the graphics shall show a list of building areas and equipment on each meter. Coordinate naming of equipment with Owner.

2.10 SURGE PROTECTION

A. Line Voltage Protection: Programmable controllers for Central Station Air Handling Units and Central Plant equipment shall be powered by 120 VAC circuits provided with surge protection. This protection is in addition to any internal protection provided by the manufacturer. A grounding conductor, (minimum 12 awg), shall be brought to each control panel from either a system grounding point or the ground bus in a breaker panel. Conduit grounds will not be acceptable. The surge protection device should be mounted so the LEDs are readily visible.

1. Surge Protector Requirements:
    a. Diagnostic LED indicates ground presence, system power and SPD function
    b. UL listed
    c. IEEE Cat A and Cat B
    d. Parallel configuration, external mount
    e. 22,500 amp peak surge current
    f. Operating Frequency: 0 Hz – 400 Hz
    g. Protective Modes: L-G, L-N, N-G
    h. Warranty: Ten Year Warranty
    i. Housing NEMA 4 ABS

PART 3 - EXECUTION

3.1 EXISTING DDC SYSTEM/COMPONENTS DEMOLITION

A. Where an existing DDC system is required to be removed to provide for installation of a new DDC system, careful attention to demolition and salvage is required. All existing DDC components, including but not limited to controllers, sensors, valve and damper operators, etc. ***shall be removed without damage and turned over to the Owner***.

B. Thermostats and sensors containing mercury shall be disposed in accordance with EPA Resource Conservation and Recovery Act (RCRA). Contractor shall refer to EPA web site for handling procedures for disposal and spill management of projects containing mercury.

C. Remove all abandoned wiring, raceway, and any related items, both exposed and concealed. Where existing raceway is concealed in concrete or masonry, remove wiring as required above and abandon in place. Cut abandoned raceway off ½" into wall, ceiling, or floor to allow patching to completely cover cut off end of raceway.

D. Repair surfaces and finishes to match existing surrounding surfaces or finish in all areas where items are removed. After repairs are made no evidence of previous use of surfaces shall be visible.

E. Provide touch-up painting as required where new items are installed adjacent to existing items to remain.
    1. Clean new, damaged, and/or disturbed areas and apply primer, intermediate, and finish coats at each location.
    2. Surface preparation and timing of application of successive coats of paint shall be in accordance with paint manufacturer's instructions.
    3. Use zinc-rich paint to repair damage to galvanized finishes. Follow written instructions of paint manufacturer.
    4. Repair paint finishes for other items, surfaces, or equipment as necessary. Follow written instructions of paint manufacturer.

F. Provide blank cover plates to match device plates used in the adjoining areas where outlet, device, junction, or other boxes are to remain.

3.2 INSTALLATION

A. General: Work schedule shall be in accordance with Division 1.

B. Wiring: The term wiring is construed to include furnishing of wire, conduit, miscellaneous material and labor to install a working system. Outdoor installations shall be of weatherproof construction or in NEMA 3R or 4 enclosures. Wiring shall be yellow jacketed No. 22 TSP for inputs and outputs. Wiring shall be purple jacketed No. 22 TSP for communication bus. Cat 5 wiring shall not be utilized.

1. Concealed accessible wiring may be installed as properly supported cable. Provide protective sleeves at wall and floor penetrations. Concealed inaccessible locations and mechanical rooms shall have wiring installed in properly sized, blue colored conduit.
2. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.
3. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
4. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables, example, blue conduit shall be used for communication and equipment wiring.
5. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.
6. An example of the required colored wiring is below:

Purpose	**Function**	**Color**
Primary Communications	Field Device Communication	Purple
Analog Points	I/O Wiring	Yellow
Digital Points	I/O Wiring	Yellow
24VAC	Control power	White/Black tracer

C. Routing: Except for short apparatus connections, run conduit parallel to or at right angles to the building structure. Conceal conduit in finished spaces. Do not run conduit concealed under insulation or inside ducts. Mount control devices, and conduit located on ducts or apparatus with external insulation on stand-off support to avoid interference with insulation.

D. Run wire connecting devices on or in control cabinets parallel with the sides of the cabinet neatly racked to permit tracing. Rack connections bridging a cabinet door along the hinge side and protect from damage.

E. Field Materials:

1. Sensors and Controls: Permanently mark terminal blocks for identification. Protect all circuits to avoid interruption of service due to short-circuiting or other conditions. Line-protect all wiring that comes from external sources to the site from lightning and static electricity. Label or code each field wire at each end. Permanently label or code each point of all field terminal strips to show the instrument or item served. Color-coded cable with cable diagrams may be used to accomplish cable identification.

    a. Temperature sensors: Temperature sensors shall be readily accessible and adaptable to each type of application in such a manner as to permit for quick, easy replacement and servicing without special tools or skills. Mount duct sensors in locations to sense the correct temperature of the air only, within the vibration and velocity limits of the sensing element. Mount extended surface element, when used, securely within the duct and position to measure the best average temperature. Thermally isolate elements from brackets and supports to respond to air temperature only. Securely seal duct penetrations. Install pipe sensors in top of pipe for horizontal runs and at a positive slope on vertical runs to prevent condensation from flowing to sensor head.
    b. Temperature sensing elements installed in liquid systems shall be installed in thermowells.
    c. Relative humidity sensors shall have air guards when installed in air flows of more than 15 meters per minute across the sensor element.
    d. Pressure Instruments: Pressure sensors (all types) installed on liquid lines shall have drains. Pressure sensors installed on steam lines shall have drains and siphons. All pressure sensors shall have valves for isolation, venting, and taps for calibration. Pressure sensors shall be verified by calibration. Differential pressure sensors shall have nulling valves. Pressure switches (all types) installed on liquid lines shall have drains. Pressure switches installed on steam lines shall have drains and siphons. All pressure switches shall have valves for isolation, and taps for calibration. Pressure switches shall be adjusted to proper setpoint, and

shall be verified by calibration. Differential pressure switches shall have nulling valves. Switch contact ratings and duty shall be selected for the application. The duct static-pressure sensing element, (tap or pitot tube), shall be located approximately two-thirds of the distance from the supply fan to the end of the duct with the greatest pressure drop. Do not locate adjacent to branches, transitions, elbows, etc. Provide taps for transmitter calibration.

e. Install potential and current transformers in NEMA enclosures. Current transformer leads shall be shorted when they are not connected to the measurement circuits.

f. Install relays and contactors in NEMA enclosures. H-O-A switches and override switches shall be installed so that controls function through the automatic position. Safety and fire or life safety interlocks shall function through both hand and automatic switch positions.

g. Damper Actuators: Outside air, return air, and relief dampers shall have individual actuators unless installed on factory assembled mixing boxes. Actuators shall be installed so that their action shall seal the damper to the extent required to maintain leakage at or below the specified rate and shall move the blades smoothly.

F. Signal Transmission System Equipment:

1. General: Install all system components in accordance with the National Electrical Code and the manufacturer's recommendations; fuse and ground them properly.

a. Splices: Splices in shielded and coaxial cables shall consist of terminations and the use of shielded cable couplers. Terminations shall be in accessible locations. Cables shall be harnessed with cable ties.

b. Equipment: Fit all equipment contained in cabinets or panels with service loops, each loop being at least 12 inches long. Equipment for fiber optics system shall be rack mounted, as applicable, in ventilated, self-supporting, code gauge steel enclosure. Cables shall be supported for minimum sag.

c. Cable Runs: Keep cable runs as short as possible. Connecting to the terminal board. Do not bend flexible coaxial cables in a radius less than ten times the cable outside diameter. Use vinyl tape, sleeves, or grommets to protect cables from abrasion or damage. Allow extra length for vibration at points where they pass around sharp corners, through walls, and panel cabinets.

d. Grounding: Ground system per manufacturer's requirements for proper and safe operation.

G. Field Test and Inspections:

1. System Equipment: Upon completion of installation of each piece of equipment, field-inspect and mechanically and electrically test equipment for proper function.

2. Field Materials: Upon completion of installation of each piece of equipment, field-inspect and mechanically and electrically test equipment for proper function.

3. Acceptance Testing. Upon completion of the installation, the Contractor shall start up the system and perform all necessary trending, scheduling calibration, testing, and debugging operations. The Contractor in the presence of the Owner’s representative shall perform an acceptance test. Acceptance test procedure to be submitted, for approval no later than 4 weeks prior to testing. Submission of test procedure shall imply that systems are complete, functional and that contractor has verified performance. Successful completion of acceptance testing shall be required prior to substantial completion.

4. Perform the following field tests and inspections and prepare test reports:

a. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.

b. Test and adjust controls and safeties.

c. Test calibration of controllers inputs, outputs, and sensors.

d. Test each point through its full operating range to verify that safety and operating control set points are as required.

e. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.

f. Test each system for compliance with sequence of operation.

g. Test software and hardware interlocks.

5. DDC Verification:
   a. Verify that instruments are installed before calibration, testing, and loop or leak checks.
   b. Check instruments for proper location and accessibility.
   c. Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.
   d. Check instrument tubing for proper fittings, slope, material, and support.
   e. Check installation of air supply for each instrument.
   f. Check flow instruments. Inspect tag number and line and bore size, and verify that inlet side is identified and that meters are installed correctly.
   g. Check pressure instruments, piping slope, installation of valve manifold, and self-contained pressure regulators.
   h. Check temperature instruments and material and length of sensing elements.
   i. Check control valves. Verify that they are in correct direction.
   j. Check air-operated dampers. Verify that pressure gages are provided and that proper blade alignment, either parallel or opposed, has been provided.
   k. Check DDC system as follows:
      1) Verify that DDC controller power supply is from emergency power supply, if applicable.
      2) Verify that wires at control panels are tagged with their service designation and approved tagging system.
      3) Verify that spare I/O capacity has been provided.
      4) Verify that DDC controllers are protected from power supply surges.
   l. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.
6. Calibrating and Adjusting:
   a. Calibrate instruments.
   b. Make three-point calibration test for both linearity and accuracy for each analog instrument.
   c. Calibrate equipment and procedures using manufacturer's written recommendations and instruction manuals. Use test equipment with accuracy at least double that of instrument being calibrated.
   d. Control System Inputs and Outputs:
      1) Check analog inputs at 0, 50, and 100 percent of span.
      2) Check analog outputs using milliampere meter at 0, 50, and 100 percent output.
      3) Check digital inputs using jumper wire.
      4) Check digital outputs using ohmmeter to test for contact making or breaking.
      5) Check resistance temperature inputs at 0, 50, and 100 percent of span using a precision-resistant source.
   e. Flow:
      1) Calibrate the input sensors to the specified accuracy.
      2) Manually operate flow switches to verify that they make or break contact.
   f. Pressure:
      1) Calibrate pressure transmitters at 0, 50, and 100 percent of span.
      2) Calibrate pressure switches to make or break contacts, with adjustable differential set at minimum.
   g. Temperature:
      1) Calibrate the input sensors to the specified accuracy.
      2) Calibrate temperature switches to make or break contacts.
   h. Stroke and adjust control valves and dampers without positioners, following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed.

i. Stroke and adjust control valves and dampers with positioners, following manufacturer's recommended procedure, so that valve and damper is 0, 50, and 100 percent closed.
j. Provide diagnostic and test instruments for calibration and adjustment of system.
k. Provide written description of procedures and equipment for calibrating each type of instrument. Submit procedures review and approval before initiating startup procedures. Document all tests and provide to WCPSS.

H. Adjust initial temperature and humidity set points.

I. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three (3) visits to Project during other than normal occupancy hours for this purpose.

3.3 OWNER INSTRUCTION AND TRAINING

A. General: The Contractor is responsible for instructing Owner's personnel, including the following:

1. Instruction in the operation of HVAC systems, subsystems, and equipment via new DDC system
2. Training in operation, maintenance, and trouble-shooting of new DDC system.

B. Program Structure: Develop an instruction and training program that includes both classroom instruction and "hands-on" demonstrations, not to exceed two eight (8) hour days' time.

C. Training Modules: Develop a learning objective and teaching outline for each instruction and training module, taking into consideration the level of proficiency of Owner's maintenance staff. Include a description of specific skills and knowledge that each participant is expected to master.

1. **Exception**: Training is required to be accomplished onsite. However, at the option of NHCS, some of or all the training required below may be accomplished for selected NHCS personnel at the DDC system vendor's offsite training facility. The cost for offsite training shall be the responsibility of NHCS.
2. For each instruction and training module, include instruction for the following, as applicable to the system, subsystem, equipment, or component:
   a. Documentation: Review the following items in detail:
      1) Operations manuals.
      2) Maintenance manuals.
      3) Project record documents.
      4) Warranties, bonds, and guarantees.
      5) Maintenance service agreements and similar continuing commitments.
   b. Emergencies: Include the following, as applicable:
      1) Instructions on meaning of warnings, trouble indications, and error messages.
      2) Shutdown instructions for each type of emergency.
      3) Operating instructions for conditions outside of normal operating limits.
      4) Sequences for DDC system.
      5) Special operating instructions and procedures.
   c. Operations: Include the following, as applicable:
      1) Start-up procedures.
      2) Equipment or system break-in procedures.
      3) Routine and normal operating instructions.
      4) Regulation and control procedures.
   d. Control Sequences:
      1) Safety procedures.
      2) Normal start-up and shutdown instructions.
      3) Operating procedures for emergencies.

4) Operating procedures for system, subsystem, or equipment failure.
5) Required sequences for electric or electronic control systems.
6) Special operating instructions and procedures.

e. Adjustments: Include the following:

1) Alignments.
2) Routine adjustments, tightening, etc.
3) Noise and vibration adjustments.
4) Economy and efficiency adjustments.

f. Maintenance and Repairs: Demonstrate the following:

1) Inspection procedures.
2) Troubleshooting and diagnostic instructions.
3) Test and inspection procedures.
4) Repair instructions.
5) Disassembly; component removal, repair, and replacement; and reassembly instructions.
6) Review of spare parts needed for operation and maintenance.

D. Training Execution:

1. Owner will furnish an instructor to describe Owner's operational philosophy.
2. Owner will furnish Contractor with names and positions of participants to attend instruction and training, not to exceed 10 individuals.
3. Provide instruction at mutually agreed on times scheduled at least four (4) weeks in advance through the A/E. For systems, subsystem, and/or equipment that requires seasonal operation, provide required instruction at start of each season.
4. Conduct training on-site in the completed and fully operational facility in classroom/conference space provided by the Owner and using the actual systems, subsystems, and equipment installed.
5. Conduct training using final operation and maintenance data submittals as the training reference material. If additional training materials are utilized, they shall be incorporated as an appendix to the operation and maintenance data submittals.
6. Provide documentation that Owner instruction and training has taken place. Provide record of dates, topics, and duration of each training session, the names of Owner's staff who participated, and a signed review form by each participant.

PART 4 - SEQUENCES OF OPERATION

4.1 CENTRAL CONTROL

A. All systems and their controllers shall be indexed to heating, cooling, or dehumidification mode of operation and energized per occupancy and equipment operation schedule by the BAS system.

4.2 OPTIMAL START/STOP

A. The scheduling application shall support an optimal start/stop algorithm. This shall calculate the thermal characteristics of each zone/space and start the HVAC system(s) equipment prior to occupancy to achieve the desired space temperature at the specified occupancy time. The algorithm shall calculate separate sets of heating and cooling rates for zones/spaces that have been unoccupied for less than and greater than 24 hours. BAS shall provide the ability to modify the start/stop algorithm based on outdoor air temperature. BAS shall provide an early start limit in minutes to prevent the system from starting before an operator determined time limit.

4.3 DOMESTIC WATER HEATING

A. Domestic water heaters operate based on their own internal thermostats.

B. BAS system shall energize domestic hot water system circulator pumps based on occupancy schedules. See plumbing drawings for system quantities and locations.

4.4 LIGHTING CONTROL

A. The Control contractor shall provide the number of outputs for lighting control as indicated on the drawings. These loads will be controlled based on time-of-day and special scheduling supplied by Owner. The Control contractor shall provide all wiring between the DDC system and the light contact. All power wiring to lighting contacts shall be by the Electrical Contractor. Lighting contacts are supplied by others.

4.5 SECURITY CONTROLS

A. The Control contractor shall connect to a dry contact point in the each of the building's security systems. The Control contractor shall provide all wiring between the DDC system and the security armed and alarmed contacts. Security contacts are supplied by others. For buildings with multiple security systems such as whole building and cafeteria, these systems shall remain separate to allow access by both parties without disarming the second system. The security armed and alarmed contacts shall be monitored by this system.

4.6 FIRE ALARM

A. Smoke detectors are supplied and wired by Electrical Contractor. Electrical Contractor shall supply and install a relay near each motor controller to shut down the unit. Central fire alarm panel shall be provided with one contact output to the DDC system to indicate system trouble or alarm. Wiring required for alarm points shall be provided by the Control contractor.

4.7 MAINTENANCE MANAGEMENT

A. The DDC system shall measure and record run time for all start/stop points in the system. Based upon the accumulated run time provide maintenance messages on the interval recommended by the equipment manufacturers.

B. Any digital input point that is used for maintenance purposes (i.e. Fan Status) shall also generate a maintenance message.

4.8 TROUBLE ALARMS

A. The Control contractor shall establish a trouble high and trouble low alarm limit for each analog input and annunciate a corresponding alarm message. Alarm and event messages shall be in plain English and not any other code language.

4.9 MODIFICATION

A. All software set-points, limits, alarms, messages, schedules, sequences, etc., as specified herein are to provide an initial setup of the control system. The Control contractor shall provide software customization that may be required to adapt the DDC system to accurately respond to actual building parameters and installed equipment. Further, these software functions shall be readily modifiable by Brunswick County personnel as changes in building operation dictate.

4.10 REMAINING SEQUENCES OF OPERATION

A. For remaining sequences of operation see M-Drawings.

END OF SECTION 230900

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 the Instructions to Bidders and General Conditions of the Contract shall be a part of the Electrical Specifications. The electrical contractor shall examine the general and special conditions before submitting a proposal.

B. The electrical work shall be performed by a licensed electrical contractor.

C. The electrical contractor shall assume total responsibility for any portion of the work provided by his subcontractors.

1.3 CODES AND STANDARDS

A. Building Codes:

1. National Fire Protection Association No. 70, National Electrical Code
2. North Carolina State Building Code, Latest Edition and Revisions (NCSBC)
3. National Electrical Safety Code (NESC)
4. National Bureau of Standards (NBS)
5. Local Codes where applicable

B. Industry Standards:

1. Underwriter's Laboratories, Inc. Standards and approved listings (UL)
2. Electrical Testing Laboratories Standards (ETL)
3. National Electrical Manufacturers Association Standards (NEMA)
4. Insulated Power Cable Engineers Association Standards (IPCEA)
5. American National Standards Institute (ANSI)
6. American Society for Testing Materials Standards (ASTM)
7. Canadian Standards Association (CSA)

1.4 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 a complete job will be provided without requests for minor extras.

1.5 RECORD DRAWINGS

A. A set of drawings covering the electrical contract will be provided to the electrical contractor to mark 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 photographs of panelboards. Photographs shall clearly show equipment designations, manufacturer nameplates, breaker positions, breaker ratings, and directory descriptions.

1.6 APPROVAL OF MATERIALS

A. See project manual contract documents for pre-bid substitution requirements.

B. Construction phase: The CONTRACTOR shall 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 shall 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, the Architect and/or Engineer being the judge of equality.

C. 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. These materials shall be third party listed or labeled in accordance with the General Statutes of the State (example: UL, ETL, CSA, etc.).

1.7 SHOP DRAWINGS AND SUBMITTAL DATA PROCEDURES

A. Unless directed otherwise in the Architectural Specifications, Civil Specifications, or General Provisions and/or Conditions of the Contract, the CONTRACTOR shall submit PDF files of shop drawings, certified prints, literature, and cuts to the Architect and/or Engineer for all major items of equipment and materials for review and approval. It is preferred that all electrical submittals for the project shall be submitted at one and the same time.

B. Product data cut sheets with multiple components, part numbers, etc. shall be clearly marked to identify what is proposed for this project.

C. The CONTRACTOR shall analyze all shop drawings and submittal data and certify that they meet requirements of Contract Drawings and Specifications, prior to delivery to the Architect and/or Engineer. CONTRACTOR Certification shall be in the form of suitable approval stamp placed on each shop drawing submitted for approval.

D. If the Architect and/or Engineer deems submittal data is either incomplete or incorrect, a resubmittal submittal will be required.

E. At least one set of all “approved” shop drawings, certified prints, etc., shall be maintained at the job site and available to representative of the Architect and/or Engineer.

F. Approval by the Architect and/or Engineer of shop drawings for any materials, apparatus, devices, and layouts shall not relieve the CONTRACTOR from the responsibility of furnishing same of proper dimensions, size, quantity, quality and all performance characteristics to efficiently perform the requirements and intent of the contract documents. Such approval shall not relieve the CONTRACTOR from responsibility for errors of any sort on the shop drawings. If the shop drawings deviate from the Contract Documents, the CONTRACTOR shall advise the Architect and/or Engineer of the deviations in writing, accompanying the shop drawings, including the reason for the deviations.

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 shall be the responsibility of the CONTRACTOR to correct at his expense. The CONTRACTOR shall assume responsibility for providing code clearances. Where equipment is designated for existing space, the CONTRACTOR shall make necessary field measurements to ascertain space requirements, including those for connections; and shall furnish and install such sizes and shapes of equipment that the final installation shall suit the intent and meaning of the drawings and specifications.

H. Catalog Data for OWNER:

1. The CONTRACTOR shall 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 Architect and/or Engineer 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 shall be

included with each item. Each manufacturer's name, address, and telephone number shall 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. Transformer tap settings and output voltages.
3. Circuit breaker trip settings.
4. Fire alarm system:

   a. NFPA 72 Fire Alarm System Record of Completion.
   b. System Status and Programming Report.
   c. System operational matrix.
   d. Digital copy of system software on USB flash drive.

5. Emergency responder radio coverage system:

   a. RF Survey / Shop Drawings: Final installed measurement drawings of each floor of the building which indicate relative RF field strength for each frequency and band of interest.

1.8 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 shall be followed as closely as actual building construction and the work of other trades will permit; however, all work shall suit the finished surroundings and/or trim.

B. 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.

C. 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 Architect and/or Engineer 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.

D. The electrical work shall 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 shall investigate the structural and finish conditions affecting the work and shall 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 Architect and/or Engineer.

E. Load circuits shall be installed as indicated on the drawings. Circuit number revisions will not be accepted unless approved in writing by the Engineer.

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.

B. The CONTRACTOR shall compare the electrical drawings and specifications with the drawings and specifications for other trades and shall report any discrepancies between them to the Architect and/or Engineer and obtain from him written instructions for changes necessary in the electrical work. The electrical work shall be installed in cooperation with other trades installing interrelated work. Before installation, the CONTRACTOR shall make proper provisions to avoid interferences in a manner approved by the Architect and/or Engineer. All changes required in the work of the CONTRACTOR caused by his neglect to do so shall be made by him at his expense.

C. Location of electrical raceways, switches, panels, equipment, fixtures, etc., shall 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 shall be made as required to maintain proper headroom and to clear pitched lines whether or not indicated on the drawings. The CONTRACTOR shall 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 Architect and/or Engineer.

F. The CONTRACTOR shall install all electrical work to permit removal (without damage to other parts) of any equipment requiring periodic replacement or maintenance. The CONTRACTOR shall 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 shall 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 shall obtain written approval from the OWNER before proceeding with work at existing facilities and shall 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 shall, 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 shall be responsible for cleanup in connection with his work at existing facilities. At the end of each working day, all debris, boxes, waste, etc. shall 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 shall do all cutting, patching, finishing, repairing, painting, etc., necessary for electrical work to be installed at existing facilities. All finishes shall 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. shall be repaired and/or replaced to equal finish prior to cutting. The CONTRACTOR shall route conduits and locate equipment as approved by the OWNER and Architect and/or Engineer. Routing and locations shall be firmly established and approved before proceeding with any phase of the work.
5. The CONTRACTOR shall be 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 shall be repaired and/or replaced by the CONTRACTOR at no additional cost to the OWNER, to equal finish prior to damage. The ARCHITECT AND/OR ENGINEER shall be the judge as to equal finishes, etc.

6. 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 shall determine in advance the dates, times and duration of these outages and shall obtain permission from the OWNER to shut down the electric power. Unauthorized power outages will not be tolerated.

H. Electrical Work Coordinated with Other Disciplines:

1. Heating, Ventilating and Air Conditioning Equipment:

   a. The electrical contractor shall provide a source of power for all mechanical equipment. "Source" shall include conductors, raceways, circuit breakers, junction boxes, panelboards and/or wiring troughs as required by conditions and codes and/or as shown on the contract drawings.
   b. In general, individual disconnecting means and circuitry for each mechanical equipment unit will be furnished and installed by the electrical contractor. Line side and load side connections at the disconnect shall be made by the electrical contractor. Load side wiring from the disconnect shall be installed by the EC, and equipment connections shall be made by the subMechanical Contractor.

2. Plumbing Equipment:

   a. Electric Water Coolers: As indicated on the drawings, the electrical contractor. shall provide either a grounding type 120V, GFCI receptacle for power supply at each electric water cooler, or the branch breaker supplying a grounding type 120V receptacle shall be GFCI type. The electrical contractor shall consult the Plumbing Contractor to determine the exact outlet location required before roughing in. All outlets and cords shall be concealed within the cabinet.
   b. Water Heaters: The electrical contractor shall provide a disconnect adjacent to the water heater as a source of power. Circuitry from the disconnect to the water heater shall be provided by the electrical contractor. Final connections shall be provided by the contractor providing the equipment.
   c. Hot Water Circulating Pump: See drawing detail. The plumbing contractor will provide an “Aquastat”. The remainder of devices and equipment shall be provided by the electrical contractor.

I. Equipment and Materials (General):

1. Materials shall 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 of applicable tables in the North Carolina Energy Conservation Code.
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 ARCHITECT AND/OR ENGINEER until installed.
      2) Rusty and/or corroded materials and equipment will be replaced at the direction of the Architect and/or Engineer.

   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 shall be of the same make throughout the work to provide uniform appearance, operation and maintenance.
5. 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 Architect and/or Engineer. Damage or defects, developing before acceptance of the work shall be corrected at the CONTRACTOR's expense.
6. 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 Architect and/or Engineer, in writing, of any conflicts between any requirements of the Contract Documents and the manufacturer's directions and shall obtain the Architect and/or Engineer'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 Architect and/or Engineer at no additional cost to the Owner.

J. Sleeves, Inserts, Openings, Etc.:

1. Anchor bolts, sleeves, inserts, supports, etc., that may be required for electrical work shall be furnished, located, and installed by the electrical contractor. Where working under a subcontract for a General Contractor, the electrical contractor shall 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 shall cut and patch construction as necessary and required to install electrical work, with finishes completed to the satisfaction of the Owner, and Architect and/or Engineer.

K. Cutting and Patching:

1. The electrical contractor shall do all rough cutting and patching as required for the proper installation of work under this contract. Cutting shall be kept to a minimum, and finishes shall be restored to the satisfaction of the Owner, and Architect and/or Engineer.

L. Locations and Measurements:

1. Outlets, equipment, and appliances are shown and located on the drawings as accurately as possible. All measurements shall be verified on the project and coordinated with the drawings of other disciplines. In all cases, the work shall suit the surrounding trim and/or decoration and construction. The locations of outlets for special appliances shall be installed so that when extended, they are flush with the finished wall, floor, or ceiling and permit the proper installation of fixtures, devices, equipment, appliances, etc. Heights of all outlets shown on the drawings are approximate only. Slight relocations of outlets, devices, and equipment shall be made by the electrical contractor as required or as directed by the Architect and/or Engineer at no additional cost to the OWNER.

M. Workmanship:

1. Work shall be executed as required by the specifications and the accompanying drawings and shall be done in a workmanlike manner by skilled mechanics, and shall present a neat, trim, and mechanical appearance when completed. All work shall be performed as required by the progress of the job.

N. Final Inspections and Equipment Demonstrations:

1. The CONTRACTOR shall 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 men to open fixtures, boxes, panels, or any other equipment to enable the Architect and/or Engineer representatives to see into any parts of the installation he may request.

3. The CONTRACTOR shall furnish meters for observation of readings as directed by the Architect and/or Engineer representative. Meters to be furnished include: clamp-on type ammeter, voltmeter, megger, and clamp-on type ground resistance tester.

O. 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. Touchup painting.
4. Firestopping
5. Concrete equipment bases.
6. Electrical demolition.

1.3 SUBMITTALS

A. Product Data:

1. For materials to firestop cable and raceway penetrations of fire-rated floor and wall assemblies.

B. Shop Drawings: UL details for firestopping cable and raceway penetrations of fire-rated floor and wall assemblies.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.

B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch diameter slotted holes at a maximum of 2 inches o.c., in webs.

1. Channel Thickness: Selected to suit structural loading.
2. Fittings and Accessories: Products of the same manufacturer as channel supports.

D. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

E. Expansion Anchors:

1. Inside: Carbon-steel wedge or sleeve type.
2. Outside: Hot-dip galvanized steel wedge or sleeve type.

F. Toggle Bolts:

1. Inside: All steel springhead type.
2. Outside: Hot-dip galvanized steel springhead type.

2.2 TOUCHUP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

2.3 FIRESTOPPING

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

2.4 CONCRETE BASES

A. Concrete: 3000-psi (20.7-MPa), 28-day compressive strength with welded wire fabric reinforcement.

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 and sleeves 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. Coordinate installing large equipment requiring positioning before closing in the building.

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.

D. Right of Way: Give to raceways and piping systems installed at a required slope.

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 indicated.

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. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

K. 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 FIRESTOPPING

A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly.

3.6 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated.

3.7 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.

3.8 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.9 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work.

3.10 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint.

1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.11 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 SUBMITTALS

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

B. Field Quality-Control Test Reports: From Contractor.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 POWER CONDUCTORS AND CABLES

A. Manufacturers:

1. Cerro Wire LLC.
2. Colonial Wire and Cable.
3. Encore Wire Corporation.
4. General Cable Corporation.
5. Okonite.
6. Prysmian Group.
7. Republic Wire, Inc.
8. Southwire.
9. Or approved equal.

B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.

C. 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.

D. Conductor Insulation Types: Type THHN/THWN-2 complying with NEMA WC70 / ICEA S-95-658.

E. Metal-Clad Cable, Type MC:

1. Description: A factory assembly of current-carrying insulated copper conductors in an overall metallic sheath.
2. Comply with NEMA WC 70 / ICEA S-95-658 for metal-clad cable, Type MC with ground wire.
3. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.

2.3 CONTROL CONDUCTORS AND CABLE

A. Discrete control conductors: Copper, stranded, type THHN/THWN-2.

1. Manufacturers:

a. Cerro Wire LLC.
b. Colonial Wire and Cable.
c. Encore Wire Corporation.
d. General Cable Corporation.
e. Okonite.
f. Prysmian Group.
g. Republic Wire, Inc.
h. Southwire.
i. Or approved equal.

2.4 CONNECTORS AND SPLICES

A. Manufacturers:

1. AFC Cable Systems.
2. AMP Incorporated/Tyco International.
3. FCI.
4. Greaves Polaris.
5. Hubbell/Anderson.
6. ILSCO.
7. NSI.
8. O-Z/Gedney; EGS Electrical Group LLC.
9. Penn Union.
10. 3M Company; Electrical Products Division.
11. Or approved equal.

B. 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 wirenut type twist connectors.
2. For conductors #6 & larger, use pre-insulated solderless connectors with one spare port(s) for future cable connection.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

A. Service Entrance, Feeders: Type THHN/THWN-2, single conductors in raceway.

B. Branch Circuits:

1. Concealed in Ceilings: Type THHN/THWN-2, single conductors in raceway or metal-clad cable, Type MC.
2. Concealed in Walls and Partitions: Type THHN/THWN-2, single conductors in raceway.

3. Exposed: Type THHN/THWN-2, single conductors in raceway, with the exception of exposed locations in electrical rooms where MC cable may be dropped to panelboards.
4. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

C. Discrete Control Circuits: Type THHN/THWN-2, in raceway.

3.2 INSTALLATION

A. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

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 shall not be used unless specifically indicated so on homerun circuitry designations on the drawings.

3.3 CONNECTIONS

A. Connect outlet 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.

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. Megger testing for building wire and cable:
    a. All current carrying phase conductors and neutrals shall be tested as installed, and before connections are made, for insulation resistance and accidental grounds. This shall be done with a 500 volt megger. Megger testers shall not be electronic type. Megger testers shall be hand crank or power driven crank type. Minimum readings between conductors and between conductor and the grounded metal raceway shall be: 25 mega-ohms for #6 wire and smaller; 50 mega-ohms for #4 wire or larger.
    b. The CONTRACTOR shall 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: Prepare a written report to record the following:

1. Test procedures used.

2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
4. Provide tabulated megger readings for each panel circuit.

C. Witness Tests:

1. The CONTRACTOR shall furnish a megger and show A/E representative and/or Owner that the conductors and panels comply with the above requirements.

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 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with UL 467.

PART 2 - PRODUCTS

2.1 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Section "Conductors and Cables."

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

PART 3 - EXECUTION

3.1 APPLICATION

A. In raceways, use insulated equipment grounding conductors.

B. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

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.

C. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch (6.4-by-50-by-300-mm) grounding bus.

3.3 INSTALLATION

A. 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.

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. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

C. Tighten screws and bolts for grounding and bonding 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.

D. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

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 and for floor-box service fittings.
3. Section "Seismic Controls for Electrical Work" for seismic restraints and bracing of raceways, boxes, enclosures, and cabinets.

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 SUBMITTALS

A. Product Data: For raceways, fittings, wireways, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: Signed and sealed by a qualified professional engineer.

1. Design Calculations: Calculate requirements for selecting seismic restraints.
2. Detail assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

C. Manufacturer Seismic Qualification Certification: Submit certification that enclosures, cabinets, accessories, and components will withstand seismic forces defined in Section "Seismic Controls for Electrical Work." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
    a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.6 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.

1.7 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 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 METAL CONDUIT AND TUBING

A. Manufacturers:

1. Alflex Inc.
2. Allied Tube and Conduit.
3. Anamet Electrical, Inc.; Anaconda Metal Hose.
4. Atkore International / Calbrite.
5. Conduit Pipe Products Company.
6. Electri-Flex Co.
7. Gibson Stainless.
8. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
9. Manhattan/CDT/Cole-Flex.
10. Maverick Tube.
11. O-Z Gedney; Unit of General Signal.
12. Patriot Industries.
13. Republic Conduit.
14. Shaw Stainless and Alloy.
15. Wheatland Tube Co.
16. Or approved equal.

B. Rigid Aluminum Conduit: Produced to ANSI C80.5; listed to UL 6A.

C. Rigid Steel Conduit: Produced to ANSI C80.1; listed to UL 6.

D. IMC: Produced to ANSI C80.6; listed to UL 1242.

E. EMT and Fittings: Produced to ANSI C80.3; listed to UL 797.

1. Fittings: Plated-steel, hexagonal, compression type.

F. FMC: Listed to UL 1.

G. LFMC: Listed to UL 360.

H. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

A. Manufacturers:

1. American International.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco.
4. Blue Diamond Industries.
5. Cantex.
6. Certainteed.
7. Condux International.
8. ElecSYS.
9. Electri-Flex.
10. Heritage Plastics / Atkore International.
11. Lamson & Sessions; Carlon Electrical Products.
12. Manhattan/CDT/Cole-Flex.
13. Queen City Plastics.
14. RACO.
15. Southern Pipe, Inc.
16. Spiralduct, Inc./AFC Cable Systems, Inc.
17. Thomas & Betts.
18. Or approved equal.

B. RNC: Produced to NEMA TC 2; listed to UL 651.

1. Schedule 40 and Schedule 80 PVC.

C. RNC Fittings: Produced to NEMA TC 3; listed to UL 514B; match to conduit or tubing type and material.

2.4 METAL WIREWAYS

A. Listed to UL 870.

B. Manufacturers:

1. Austin.
2. B-Line.
3. Hammond/
4. Hoffman.
5. Milbank.
6. Square D.
7. Thomas & Betts.
8. Unity Manufacturing.
9. Or approved equal.

C. Material and Construction: Sheet metal sized and shaped as indicated.

1. Indoors: NEMA 1.
2. Outdoors: NEMA 3R.

D. 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.

E. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

F. Wireway Covers:

1. Indoors: Hinged type.
2. Outdoors: Flanged-and-gasketed type.

G. Finish: Manufacturer's standard enamel finish.

2.5 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers:

1. Arlington.
2. Austin.
3. B-Line.
4. Cooper Crouse-Hinds.
5. Emerson/General Signal; Appleton Electric Company.
6. Erickson.
7. FSR.
8. Hammond.
9. Hoffman.
10. Hubbell.
11. Milbank.
12. O-Z/Gedney.
13. Peerless.
14. RACO.
15. Robroy Industries.
16. Rose + Bopla.
17. Scott Fetzer Co.; Adalet-PLM Division.
18. Spring City Electrical.
19. Strong.
20. Thomas & Betts.
21. Vynckier.
22. Walker Systems.
23. Woodhead Industries.
24. Or approved equal.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.

D. Floor Boxes: Cast metal, fully adjustable, rectangular.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

F. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

G. 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.

H. 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 APPLICATION

A. Outdoors:

1. Exposed: Rigid metal or IMC.
2. Concealed: Rigid metal or IMC.
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. For grounding electrode conductors: RNC Schedule 80.
7. Boxes and Enclosures: NEMA 250, Type 3R.

B. Indoors:

1. Exposed, Higher than 10' AFF: EMT**.**
2. Exposed, Lower than 10' AFF:
   a. In Electrical Rooms: EMT.
   b. Elsewhere: Rigid metal or IMC.
3. Concealed: EMT.
4. Underground branch circuits: RNC.
5. Underground feeders: RNC. Where turning up out of the slab, a rigid metal elbow and rigid metal conduit shall be used.
6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
7. Damp or Wet Locations: Rigid metal conduit.
8. For grounding electrode conductors: RNC Schedule 80.
9. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
   a. Damp or Wet Locations: NEMA 250, Type 4.

C. Minimum Raceway Size: 3/4-inch trade size (DN 21).

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Intermediate Steel Conduit: Use threaded rigid metal conduit fittings, unless otherwise indicated.

E. Do not install aluminum conduits embedded in or in contact with earth or concrete. For direct burial or concrete encasement or penetrations, coat conduit with asphaltum or bituminous type coating.

F. EMT shall 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.

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 shall 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. Raceway connectors shall be insulated throat type. If uninsulated throat connectors are installed, use insulating bushings to protect conductors.

L. Expansion joints: Where raceways of any type pass a building or structure expansion joint, a standard expansion joint fitting, compatible with the type of raceway being used, shall be provided and installed. Review architectural and structural drawings for locations of expansion joints.

M. Underground raceways:

1. Where turning up to cabinets, equipment, poles, etc.; transition from horizontal underground PVC to rigid metal for elbows & raceway stub-ups.

N. 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.

O. 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.

P. 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.

Q. 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.

R. Set floor boxes level and flush with finished floor surface.

S. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.3 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets 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, shall be coated with galvanizing paint or equivalent protective coating.

END OF SECTION 260533

SECTION 260548 - SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

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. Restraint channel bracings.
2. Restraint cables.
3. Seismic-restraint accessories.
4. Mechanical anchor bolts.
5. Adhesive anchor bolts.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
    a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
    b. Annotate to indicate application of each product submitted and compliance with requirements.

B. Delegated-Design Submittal: For each seismic-restraint device.

1. Include design calculations and details for selecting seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Design Calculations: Calculate static and dynamic loading caused by equipment weight, operation, and seismic and wind forces required to select seismic and wind restraints and for designing vibration isolation bases.
    a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
3. Seismic- and Wind-Restraint Details:
    a. Design Analysis: To support selection and arrangement of seismic and wind restraints. Include calculations of combined tensile and shear loads.
    b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
    c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
    d. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

C. Product Certificates: Signed by manufacturers of seismic restraints certifying that products furnished comply with requirements, including the testing requirements of the 2012 North Carolina Building Code, Section 1708.4.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Comply with seismic restraint requirements in 2012 North Carolina Building Code, Section 1613, unless requirements in this Section are more stringent.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing seismic engineering services, including the design of seismic restraints, that are similar to those indicated for this Project.

C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis. They shall bear anchorage preapproval from OSHPD in addition to preapproval, showing maximum seismic-restraint ratings, by ICC-ES or another agency acceptable to authorities having jurisdiction. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) that support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

D. Comply with NFPA 70.

1.6 PROJECT CONDITIONS

A. Seismic Design Category: See the project Code Summary drawing and structural drawings.

B. See the project Code Summary drawing and structural drawings for additional building construction criteria.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Wind-Restraint Loading:

1. Basic Wind Speed: Obtain value from Figure 1609, North Carolina Basic Wind Map, in the 2012 North Carolina Building Code.
2. Building Classification Category: See the project Code Summary drawing and structural drawings.
3. Minimum 10 lb/sq. ft. (48.8 kg/sq. m) multiplied by maximum area of equipment component projected on vertical plane normal to wind direction and 45 degrees either side of normal.

B. Seismic-Restraint Loading:

1. Seismic Design Category: See the project Code Summary drawing and structural drawings.

2.2 RESTRAINT CHANNEL BRACINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper B-Line, Inc.; a Division of Cooper Industries.
2. Hilti, Inc.

3. Mason Industries, Inc.
4. Unistrut; Atkore International.

B. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end, with other matching components, and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.3 RESTRAINT CABLES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Kinetics Noise Control, Inc.
2. Loos & Co., Inc.
3. Vibration Mountings & Controls, Inc.

B. Restraint Cables: ASTM A 603 galvanized-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

2.4 SEISMIC-RESTRAINT ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper B-Line, Inc.; a Division of Cooper Industries.
2. Kinetics Noise Control, Inc.
3. Mason Industries, Inc.
4. TOLCO; a brand of NIBCO INC.

B. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections or reinforcing steel angle clamped to hanger rod.

C. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings and restraint cables.

D. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings and matched to type and size of anchor bolts and studs.

E. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices used.

F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.5 MECHANICAL ANCHOR BOLTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper B-Line, Inc.; a Division of Cooper Industries.
2. Hilti, Inc.
3. Kinetics Noise Control, Inc.
4. Mason Industries, Inc.

B. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength

required for anchor and as tested according to ASTM E 488. Note: Expansion-type anchor bolts are not permitted by ASCE/SEI 7 for nonisolated equipment in excess of 10 hp (7.46 kW).

2.6 ADHESIVE ANCHOR BOLTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Hilti, Inc.
2. Kinetics Noise Control, Inc.
3. Mason Industries, Inc.

B. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for 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 COORDINATION

A. Coordinate layout and installation of seismic bracing with building structural system and architectural features, and with mechanical, fire-protection, electrical, and other building features in the vicinity.

B. Coordinate concrete bases with building structural system.

3.3 APPLICATIONS

A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where required to prevent buckling of hanger rods caused by seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.4 SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork."

B. Equipment and Hanger Restraints:

1. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).
2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

E. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

F. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.5 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.6 FIELD QUALITY CONTROL

A. The Professional Engineer retained for seismic restraint calculations shall visit the job site as necessary to comply with the Special Inspections requirement of the North Carolina Building Code, Section 1707. This engineer shall provide in writing verification of compliance of the installation with the approved seismic submittal. This verification shall be submitted as a Special Inspections Report and shall bear the Engineer’s professional seal. Job site inspections by other than this engineer are not acceptable.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative (if required):

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect / Engineer, before connecting anchorage device to restrained component (unless post-connection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect / Engineer's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect / Engineer.
5. Test to 90 percent of rated proof load of device.

C. Seismic controls will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.7 ADJUSTING

A. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 260548

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 SUBMITTALS

A. Product Data:

1. For each electrical identification product indicated.
2. For double coated, adhesive tape product indicated.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with NFPA 70 for color-coding.

PART 2 - PRODUCTS

2.1 CABLE LABELS

A. Colored Adhesive Tape: Self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches.

B. Underground-Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape.

1. Not less than 6 inches wide by 4 mils thick.
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend indicating type of underground line.

2.2 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. High performance, double coated tape with adhesive. Design Basis: 3M #06383, 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: Pressure-sensitive, self-adhesive plastic label on cover.
b. Concealed:

1) Pressure-sensitive, self-adhesive plastic label on cover; or
2) Permanent marker on cover, legible by Architect, Engineer, and Owner.

2. Exterior Boxes:

a. Engraved plastic label on cover; and
b. Pressure-sensitive, 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:

	Configuration	Phase A	Phase B	Phase C	Neutral	Ground
1.	120/240-V, 1 Ph, 3W	Black	Red	N/A	White	Green
2.	120/240-V, 3 Ph, 4W	Black	Orange	Blue	White	Green
3.	120/208-V, 3 Ph, 4W	Black	Red	Blue	White	Green
4.	277/480-V, 3 Ph, 4W	Brown	Orange	Yellow	Gray	Green

5. For conductors #6 AWG and smaller, factory apply color the entire length of conductors.
6. 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.
7. At each panelboard, a color code legend shall 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 unless units are delivered with their own self-explanatory identification. Attached engraved labels with 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 and enclosed circuit breakers.
4. Transformers.
5. Inverters.
6. Contactors.
7. Remote-controlled switches.
8. Control devices and push-button stations.
9. Fire alarm control panels, master stations, control panels, local operator consoles, and power supplies.
10. Security-monitoring master stations and control panels.
11. Public address, intercom, and paging system equipment.
12. TV / audio / video system equipment.

J. 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. Time switches.
2. Outdoor photoelectric switches
3. Switchbox-mounted occupancy and vacancy sensors.
4. Indoor occupancy and vacancy sensors.
5. Multipole contactors.

1.3 DEFINITIONS

A. PIR: Passive infrared.

1.4 SUBMITTALS

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

B. Shop Drawings: Show installation details for occupancy and light-level sensors.

1. Lighting plan showing location, orientation, and coverage area of each sensor.
2. Interconnection diagrams showing field-installed wiring.

C. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

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 TIME SWITCHES

A. Manufacturers:

1. Area Lighting Research, Inc.
2. Fisher Pierce.
3. Grasslin Controls Corporation.
4. Intermatic, Inc.
5. Paragon Electric Co.
6. TORK.
7. Watt Stopper (The).

B. Digital Time Switches: Electronic, solid-state programmable units with alphanumeric display complying with UL 917.

1. Contact Configuration: DPST.
2. Contact Rating: 30-A inductive or resistive, 240-V ac.
3. Program: Single channel, 8 on-off set points on a 24-hour schedule and an annual holiday schedule that overrides the weekly operation on holidays.
4. Circuitry: Allow connection of a photoelectric relay as substitute for on and off function of a program.
5. Astronomical Time: All channels.
6. Battery Backup: For schedules and time clock.

2.4 OUTDOOR PHOTOELECTRIC SWITCHES

A. Manufacturers:

1. Area Lighting Research, Inc.
2. Fisher Pierce.
3. Grasslin Controls Corporation.
4. Intermatic, Inc.
5. Paragon Electric Co.
6. TORK.
7. Touchplate Technologies, Inc.
8. Watt Stopper (The).

B. Description: Solid state, with DPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, microprocessor input, and complying with UL 773A.

1. Light-Level Monitoring Range: 1.5 to 10 fc (16 to 108 lx), with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of photocell to prevent fixed light sources from causing turn-off.
2. Time Delay: 15-second minimum, to prevent false operation.
3. Surge Protection: Metal-oxide varistor type, complying with IEEE C62.41 for Category A1 locations.
4. Mounting: Twist lock complying with IEEE C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the North sky exposure.

2.5 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. 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.

D. Dual Relay Unit: Device contains two relays for controlling independent lighting loads or circuits.

1. Design Basis: Hubbell #LHMTD2.
2. Two On-Off buttons for manual control.

E. Dimmer Unit:

1. Design Basis: Legrand / WattStopper #DW-311.
2. Dimming Control Signal: 0-10 VDC.
3. Suitable for multi-way control from up to four locations.

2.6 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.
7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (215 to 2150 lx); keeps lighting off when selected lighting level is present.

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 (150-mm) minimum movement of any portion of a human body that presents a target of at least 36 sq. in. (232 sq. cm), and detect a person of average size and weight moving at least 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch- (2440-mm-) 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.

2.7 MULTIPOLE CONTACTORS

A. Manufacturers:

1. Allen-Bradley/Rockwell Automation.
2. Cutler-Hammer; Eaton Corporation.
3. GE Industrial Systems.
4. Siemens.
5. Square D.

B. Description: Electrically operated and mechanically held, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
2. Control-Coil Voltage: Match control power source.

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. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 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 time switches and 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.

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 Final 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 SUBMITTALS

A. Product Data: For each type of panelboard, overcurrent protective device, accessory, and component indicated. 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.

C. Manufacturer Seismic Qualification Certification: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Section "Seismic Controls for Electrical Work." Include the following:

1. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Panelboard Schedules: For installation in panelboards.

E. Operation and Maintenance Data: For panelboards and components 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 overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device.
3. Circuit breaker trip settings.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of panelboards and are typically based on Square D products. Products of other manufacturers are acceptable if they can be installed in the space indicated.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Architect/Engineer/Owner no fewer than two weeks in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Owner's written permission.

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. Eaton Corporation; Cutler-Hammer Products.
b. General Electric Co.; Electrical Distribution & Protection Div.
c. Siemens Energy & Automation, Inc.
d. Square D.

2.2 MANUFACTURED UNITS

A. Enclosures: Flush- and surface-mounted cabinets, as scheduled in the drawings. NEMA PB 1, Type 1.

1. Rated for environmental conditions at installed location.

a. Outdoor Locations: NEMA 250, Type 3R.
b. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2. Front Hinged Trim: Entire front trim hinged to box with full-length piano hinge, and with standard door within hinged trim cover.
3. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
4. 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: Adequate for 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. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.

F. 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.

G. Fabricate and test panelboards to withstand seismic forces defined in Section "Seismic Controls for Electrical Work."

2.3 PANELBOARD SHORT-CIRCUIT RATING

A. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.4 DISTRIBUTION PANELBOARDS

A. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

B. Main Overcurrent Protective Devices: Circuit breaker.

C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

2.5 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

B. Main Overcurrent Protective Devices: Circuit breaker, where scheduled.

C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

2.6 OVERCURRENT PROTECTIVE DEVICES

A. 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. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip-unit circuit breakers shall have RMS sensing; field-replaceable rating plug; and with the following field-adjustable settings:

a. Instantaneous trip.
b. Long- and short-time pickup levels.
c. Long- and short-time time adjustments.
d. Ground-fault pickup level, time delay, and I^2t response.

4. GFCI Circuit Breakers: Single- and two-pole configurations

a. 5-mA trip sensitivity for personnel protection.
b. 30-mA trip sensitivity for equipment protection.

B. 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.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
4. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
5. Shunt Trip: Where required or indicated, 120-V trip coil energized from separate circuit.

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.

E. Panel breaker configurations shall 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.

I. Install overcurrent protective devices and instrumentation.

1. Set field-adjustable switches and circuit-breaker trip ranges.
2. Prepare documentation of circuit breaker trip settings for Owner record documents.

J. Comply with mounting and anchoring requirements specified in Section "Seismic Controls for Electrical Work."

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Section "Electrical Identification".

B. Create a directory to indicate installed circuit loads. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. 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 shall 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. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.5 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. Single and duplex receptacles and ground-fault circuit interrupter receptacles.
2. Single- and double-pole snap switches and dimmer switches.
3. Device wall plates.
4. Floor service outlets.

1.3 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

1.4 SUBMITTALS

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

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device through one source from a single manufacturer.

B. 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.

C. Comply with NFPA 70.

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. Floor Service Outlets:

a. Hubbell Incorporated; Wiring Device-Kellems.
b. Pass & Seymour/Legrand; Wiring Devices Div.
c. Square D/Groupe Schneider NA.
d. Thomas & Betts Corporation.
e. Wiremold Company (The).

2.2 RECEPTACLES

A. Straight-Blade-Type Receptacles: Comply with NEMA WD 1, NEMA WD 6, DSCC W-C-596G, 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 shall be listed weather-resistant type.
5. Receptacles shall accommodate back and side wiring and shall 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. 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- (70-mm-) deep outlet box without an adapter.

2.3 SWITCHES

A. Single- and Double-Pole Switches: Comply with DSCC W-C-896F and UL 20.

B. Snap Switches:

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.

C. 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. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 10 percent of full brightness.

2.4 WALL 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. Material for Wet Locations: Cast aluminum, weatherproof, "in-use" type. Receptacle box covers shall be weatherproof whether or not a cord & plug are inserted or not.
6. Toggle Switch Serving as a Disconnect: Wallplate shall be configured with brackets on both sides of the switch to accommodate a padlock to secure the switch in the Off position.

2.5 FLOOR SERVICE FITTINGS

A. Type: Modular, flush-type, dual-service units suitable for wiring method used.

B. Compartments: Barrier separates power from voice and data communication cabling.

C. Service Plate: Rectangular, die-cast aluminum or solid brass with finish selection by the Architect.

D. Power Receptacle: NEMA WD 6, Configuration 5-20R, unless otherwise indicated.

E. Voice and Data Communication Outlet: Modular, keyed, color-coded, RJ-45 jacks for data cable, unless otherwise indicated.

2.6 POKE-THROUGH ASSEMBLIES

A. Description: Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service-outlet assembly.

B. Standards: Comply with scrub water exclusion requirements in UL 514.

C. Service-Outlet Assembly: Flush type with one or two simplex duplex receptacles as indicated and space for data and communications jacks as detailed.

D. Size: Selected to fit cored holes in floor and matched to floor thickness.

E. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.

F. Wiring Raceways and Compartments: For a minimum of five No. 10 AWG conductors and a minimum quantity of Cat 6A, four-pair cables and other communications cables as detailed.

1. Power: 3/4" minimum conduit.
2. Communications: 2” conduit.

G. Cover: Round, cast metal.

2.7 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.

B. Install tamper-resistant receptacles at locations as required by the NEC and/or the local authority having jurisdiction.

C. Install wall dimmers to achieve indicated rating after derating for ganging according to manufacturer's written instructions.

D. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' written instructions.

E. 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.

F. Remove wall plates and protect devices and assemblies during painting.

G. Adjust locations of floor service outlets to suit arrangement of partitions and furnishings. Coordinate final placement with Architect and Owner.

3.2 IDENTIFICATION

A. Comply with Section “Electrical Identification."

1. Receptacles: 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."

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 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

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 individually mounted, enclosed switches and circuit breakers:

1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit breakers.
4. Enclosures.

1.3 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

B. HD: Heavy duty.

C. RMS: Root mean square.

1.4 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current rating.
4. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

B. Field quality-control test reports including 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.

C. 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.
2. Time-current curves, including selectable ranges for each type of circuit breaker.
3. Circuit breaker trip settings.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FUSIBLE AND NONFUSIBLE SWITCHES

A. Manufacturers:

1. Eaton Corporation; Cutler-Hammer Products.
2. General Electric Co.; Electrical Distribution & Control Division.
3. Hubbell.
4. Legrand.
5. Siemens Energy & Automation, Inc.
6. Square D/Group Schneider.

B. Fusible Switch, 1200 A and Smaller: NEMA KS 1, Type HD, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept two padlocks, and defeatable door interlocks when the operating handle is in the “ON” position. Short-circuit withstand ratings of 100kA or 200kA require Class R or Class J rejection fuse block feature.

C. Nonfusible Switch, 1200 A and Smaller: NEMA KS 1, Type HD, lockable handle with capability to accept two padlocks, and defeatable door interlocks when the operating handle is in the “ON” position.

D. 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; and labeled for copper and aluminum neutral conductors.

2.3 MOLDED-CASE CIRCUIT BREAKERS AND SWITCHES

A. Manufacturers:

1. Eaton Corporation; Cutler-Hammer Products.
2. General Electric Co.; Electrical Distribution & Control Division.
3. Siemens Energy & Automation, Inc.
4. Square D/Group Schneider.

B. Molded-Case Circuit Breaker: NEMA AB 1, 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. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic Trip-Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:

a. Instantaneous trip.
b. Long- and short-time pickup levels.
c. Long- and short-time time adjustments.
d. Ground-fault pickup level, time delay, and I^2t response.

4. GFCI Circuit Breakers: Single- and two-pole configurations.

a. 5-mA trip sensitivity for personnel protection.
b. 30-mA trip sensitivity for equipment protection.

C. Molded-Case Circuit-Breaker Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical style suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
4. For breakers rated 1200A or higher, provide arc energy reduction to comply with NEC 240.87.
5. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
6. Shunt Trip: Where indicated, 120-V trip coil energized from separate circuit.

2.4 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

1. Outdoor Locations: NEMA 250, Type 3R.
2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

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.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.

B. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated. Anchor floor-mounting switches to concrete base.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Section "Electrical Identification."

B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate as specified in Section "Electrical Identification."

3.4 FIELD QUALITY CONTROL

A. Prepare for acceptance testing as follows:

1. Inspect mechanical and electrical connections.
2. Verify switch type and labeling verification.
3. Verify rating of installed fuses.
4. Inspect proper installation of type, size, quantity, and arrangement of mounting or anchorage devices complying with manufacturer's certification.

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 switches and molded-case circuit breakers. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.5 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

B. Prepare documentation of circuit breaker trip settings for Owner record documents.

3.6 CLEANING

A. On completion of installation, vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.

B. Inspect exposed surfaces and repair damaged finishes.

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 LED luminaires, 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 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaires.
4. Include emergency lighting units, including batteries, chargers, photometric performance data.
5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.

1.5 INFORMATIONAL SUBMITTALS

A. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.

2. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
3. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Provide luminaires from a single manufacturer for each luminaire type.

C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 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: Five years from date of Final 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 shall comply with NEMA LE 4.
4. UL Listing: Listed for damp or wet location as applicable.

B. CRI minimum of 80 CCT at 4000 K.

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.

2.2 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.

2.3 EXIT SIGNS

A. General: Comply with UL 924; for sign colors and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:

1. 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. .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.

2.4 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 relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place. Label shall include the following lamp characteristics:

1. "USE ONLY" and include specific lamp type.
2. Lamp diameter, shape, size, wattage, and coating.
3. CCT and CRI for all luminaires.

2.5 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.

2.6 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. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

F. 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 shall 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.

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 shall be tested for 90 minutes. The battery test shall demonstrate compliance with the requirements of NEC 700.12(F). 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 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. Fire-alarm control unit
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Heat detectors.
5. Notification appliances.
6. Addressable interface device.

1.4 DEFINITIONS

A. AHJ: Authority Having Jurisdiction.

B. LED: Light-emitting diode.

C. NICET: National Institute for Certification in Engineering Technologies.

D. 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 70, National Electrical Code.

C. Comply with applicable provisions of NFPA 72, National Fire Alarm Code.

D. Equipment supplied shall be specifically listed for its intended use and shall be installed in accordance with the manufacturer's instructions.

E. Seismic Performance: Fire-alarm control unit and raceways shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

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 III (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 trained and certified by manufacturer for installation of units specifically required for this Project within the most recent 24 months.
2. Personnel shall be certified by NICET as fire-alarm Level II (minimum) technician.
3. If not trained by the manufacturer within 24 months (as noted in 1 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, by a qualified testing agency, and marked for intended location and application.

G. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

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.

B. Product Data:

1. Manufacturer data for each type of product, equipment, device, etc. proposed.
2. For devices, include milliamp (mA) draw and listed minimum voltage required to operate for each type of device.
3. For panels and power supplies, include voltage drop allowed for the panel and power supplies.

4. For panels and power supplies, include voltage drop for individual Notification Appliance Circuits (NAC).

C. Shop Drawings: For fire-alarm system to demonstrate compliance with project drawings and specifications. Include plans, elevations, sections, details, and attachments to other work.

1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
2. Provide floor plans with:
    a. Final equipment and device locations, including address of each addressable device and notification appliance.
    b. Wiring diagrams with proposed conduit routing and conductors/cables in each conduit section.
    c. Distances for NAC circuitry sections.
3. Provide voltage drop calculations for notification appliance circuits. Voltage drop at EOL device shall not exceed 14% of the battery voltage. Worst case voltage at each notification appliance shall be no less than the minimum listed operating voltage.
4. Provide battery calculations.
    a. Fire alarm system battery calculations.
    b. Audio alarm signaling system battery calculations if not included in main fire alarm system calculations.
5. System Response Matrix:
    a. Indicate fire alarm system's actions (outputs) required for each type of alarm, supervisory, and trouble signal.

D. Installation Instructions: Manufacturer's detailed installation instructions for Fire Alarm Control Unit, duct mounted smoke detectors, flow switches, tamper switches, supervisory switches, and similar items which require mechanical installation.

E. Field quality-control reports.

F. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section "Operation and Maintenance Data," include the following:

1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
3. System Status and Programming Report.
4. Record copy of site-specific software on CD and USB flash drive (thumb drive).
5. As-built documents.
    a. Provide duplicates of the shop drawing plans, wiring diagrams, and riser diagrams showing comprehensive and clear field revisions. Include loop numbers, device addresses, terminal numbers where connected to equipment, and wire color codes.
    b. Provide a drawing with submitted battery and voltage drop calculations. Include a field for entering actual metered values during system testing.
6. 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.
7. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:
    a. Frequency of testing of installed components.
    b. Frequency of inspection of installed components.

c. Requirements and recommendations related to results of maintenance.
d. Manufacturer's user training manuals.

8. Manufacturer's required maintenance related to system warranty requirements.
9. Abbreviated operating instructions, framed and mounted at fire-alarm control unit.

1.8 PROJECT CONDITIONS

A. An existing Notifier AM2020 Fire Alarm Control Panel is located at Control Room 1129. This panel shall be removed and a new fire alarm control panel installed.

1. The new fire alarm control panel shall be compatible with existing devices and appliances.
2. Perform a full test of the existing system prior to starting work. Document any equipment or components not functioning, in trouble, or in alarm. Report deficiencies to the Owner and Architect for resolution prior to starting demolition and construction activities.
3. 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.
4. The Contractor shall extract and retrieve existing FACP programming as necessary for the new FACP to function with existing system components. If programming is not retrieved, the contractor shall field investigate and program the new FACP to function with all existing devices, appliances, and equipment that remains.

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 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning with Final Acceptance, provide software support for one year.

C. Upgrade Service:

1. Update software to latest version at Project completion.
2. The manufacturer and authorized distributor of the system installed shall maintain software records on the system installed.
3. At no charge, install and program software upgrades that become available within one year from date of Final Acceptance and for the life of the warranty period. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.
4. For new software versions that correct operating problems or bugs, free upgrades shall be provided during the life of the system.
5. Provide 30 days notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.10 WARRANTY

A. Provide parts and labor warranty of one year from the date of final inspection and/or 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. Automatic sprinkler system water flow.

B. Fire-alarm signal shall initiate the following actions:

1. Record events in the system memory.
2. Continuously operate alarm notification appliances until initiating device and control unit have been reset.
3. Identify alarm at fire-alarm control unit with flashing LED, audible piezo-electric signal, and LCD display of alarm point and location.
4. Identify alarm at fire-alarm remote annunciator with flashing LED, audible piezo-electric signal, and LCD display of alarm point and location.
5. Transmit an alarm signal to the remote alarm receiving station.
6. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode. Typically, shutdown of all HVAC equipment will be initiated.
7. Activate audio alarm communication system.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Ground or a single break in fire-alarm control unit internal circuits.
4. Break in standby battery circuitry.
5. Failure of battery charging.
6. Abnormal position of any switch at fire-alarm control unit or annunciator.
7. Loss of primary power or abnormal ac voltage at fire-alarm control unit.
8. HVAC bypass defeat switch in bypass position.

E. System Trouble and Supervisory Signal Actions:

1. Initiate annunciation at fire-alarm control unit and remote annunciators.
2. Provide adjustable time delay capability of 0 to 60 minutes to delay transmission of the trouble signals. The delay for loss of primary power or abnormal ac voltage shall be 1 to 3 hours.

2.2 FIRE-ALARM CONTROL UNIT

A. General Requirements for Fire-Alarm Control Unit (FACU):

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864 and listed and labeled by an NRTL.

a. System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies.
b. Include a real-time clock for time annotation of events on the event recorder and printer. Time of day and date shall be retained upon loss of system primary and secondary power.
c. The system shall have multiple access levels for Owner authorized personnel to disable individual alarm inputs or normal system responses for alarms, without changing the system's programming.

d. Programming and editing of the existing program shall be possible without special equipment and without interrupting alarm monitoring functions.

2. Enclosure:

a. 3rd party listed cabinet suitable for surface or semi-flush mounting.
b. Finish: Rust resistant primer and manufacturer standard finish.
c. Door hinged on either right or left side (field selectable).
d. Door with key lock and glass opening for viewing all indicators.

3. Addressable initiation devices that communicate device identity and status (normal, trouble, and alarm conditions).

a. Smoke sensors shall additionally communicate sensitivity setting and allow for adjustment of sensitivity at fire-alarm control unit.
b. Temperature sensors shall additionally test for and communicate the sensitivity range of the device.
c. Alarm Verification: The system shall provide, as a feature, an alternate signal processing algorithm to verify the presence of smoke. The algorithm shall be selectable when programming. The total effective delay created by the algorithm shall not exceed 60 seconds.

4. Addressable control circuits for shutdown of mechanical equipment.
5. Signaling Line Circuits (SLC) Interface Boards:

a. Integral microprocessor with capability of operating locally in the event of FACU main microprocessor.
b. Provides power and communication with devices on SLC circuit loop.
c. Receives and processes analog information from all detectors with software to automatically maintain detectors' desired sensitivity levels
d. Automatic detector testing and determination of detector maintenance requirements.

6. The system shall retain historical data and device parameters including device sensitivity measurement testing results. The system shall have the capability to display and print device data, parameters, and sensitivity test results. Trouble indication shall be initiated when any smoke detector approaches 80% of its alarm threshold due to gradual contamination.

B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, backlit, 3 lines (minimum) of 80 characters, minimum.
2. Individual, color-coded system status LEDs for AC POWER, SYSTEM ALARM, SYSTEM TROUBLE, and SIGNAL SILENCE.
3. Keypad: Alphanumeric; arranged to permit entry and execution of field programming, display, and control commands.
4. Operator interface functions:

a. Acknowledge Switch.
b. Alarm Silence Switch with a Subsequent Alarm resound feature.
c. System Reset Switch.
d. System Test Switch.
e. Lamp Test Switch.

C. Circuits: All circuits shall have a pathway survivability of LEVEL 1.

1. Notification Appliance Circuits (NAC):
   a. Maintain NFPA Class designation of existing NAC circuitry.
   b. NAC circuits shall not exceed 75% of maximum load current allowed.
2. Signaling Line Circuits (SLC):
   a. Maintain NFPA Class designation of existing SLC circuitry.

b. Configure with no "T" taps.
c. Retain a minimum of 20% spare addresses.

3. Isolation Modules:

a. Isolation modules shall automatically isolate wire-to-wire shorts on an SLC circuit.
b. Install isolation modules at the following locations:

1) In or adjacent to the FACU at each end of addressable loops.
2) After each 20 initiating devices and control points on an addressable loop.
3) For addressable loops with less than 20 devices and control points, install isolators at the middle of the loop in addition to those at the FACU.
4) At the point where an addressable loop extends outside of the building.
5) In terminal cabinets on each floor where addressable loops cover more than one floor level.

c. Isolation modules shall be readily accessible, not located above ceilings, and clearly labeled. Record drawings shall indicate isolator module locations.
d. Provide an LED that flashes to indicate the isolation module is operational and that burns steady to indicate that a short circuit condition has been detected and isolated.

4. Wiring Methods:

a. All fire alarm circuitry shall be in ¾" minimum metal conduit or surface metal raceway. 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. SLC addressable loop circuits shall be wired with type FPL/FLLR/FPLP fire alarm cable, 18 AWG minimum, low capacitance, copper, twisted pair. Cable jacket shall have a red jacket with red and black conductor insulation. For underground circuits, use type TC or PLTC cable (PE insulated).
c. 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) Door Control Circuits (magnet power) - Orange.
6) Elevator Capture Circuits - Brown.
7) Separate 24 VDC operating power (for equipment) - Yellow(+) / Brown(-).
8) Circuits from zone adapter modules (ZAMs) to monitored devices - Violet(+) / Gray().

d. Conduits that penetrate exterior walls shall be sealed with non-hardening electrical putty to prevent condensation infiltration.
e. Splices are allowed only at device terminals or on terminal blocks in cabinets.
f. Terminal block screws shall have pressure wire connectors of the self-lifting or box lug type.
g. Permanent wire markers shall be used to label connections at the FACU, other control equipment, power supplies, and in terminal cabinets.
h. Branch circuit breakers supplying 120 VAC to system equipment shall be physically protected with a breaker handle lock and identified with a ¼" permanent red dot applied to the breaker handle or exposed body area.

D. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

1. Batteries:

a. Gel-cell, sealed, plate nickel cadmium, maintenance free.
b. Minimum of 24 hours standby capacity plus:

1) 5 minutes of horn/strobe full alarm load.

2. Charger: Dual-rate charging techniques for fast battery recharge.

2.3 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes:

1. Comply with UL 38.
2. Single-action mechanism, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
3. Positive, visual indication of operation.
4. Station Test and Reset: Key-operated switch.
5. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
6. Pull Station Cover with Horn:

    a. Clear, tamperproof, polycarbonate cover hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.
    b. Listed for outdoor use for outdoor pull stations.
    c. Flush mount cover for recessed boxes. Surface mount cover with conduit spacer for applications requiring surface mounted conduit.

2.4 SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall typically be two-wire type for connection to an SLC. Four-wire type detectors may be required if connecting to an existing four-wire system.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
4. Integral Visual-Indicating Lights: Provide both alarm and power LEDs, flashing under normal conditions. LEDs shall burn steady, controlled by the FACU, to indicate an alarm condition.
5. 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.
6. Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore them to normal operation.
7. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.
8. 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) or initiated remotely on command from the FACU when in "test" condition.
9. Detectors shall store an identifying device type code for FACU identification of devices as either ION, PHOTO, or THERMAL.
10. Sounder Bases: Provide bases with integral sounder rated 85 dB minimum, measured at 10 feet.

B. Photoelectric Smoke Detectors:

1. Use photoelectric / light scattering principal to measure smoke density and send data to the FACU representing analog level of smoke density.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.

c. Present average value.
d. Present sensitivity selected.
e. Sensor range (normal, dirty, etc.).

2.5 HEAT DETECTORS

A. General Requirements for Heat Detectors:

1. Comply with UL 521.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
3. Integral Visual-Indicating Lights: Provide both alarm and power LEDs, flashing under normal conditions. LEDs shall burn steady, controlled by the FACU, 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. Use electronic sensor to measure thermal conditions caused by fire and send data to the FACU representing analog level of such thermal conditions.

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.
4. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.6 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, equipped for mounting as indicated and with screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections. Comply with requirements for both visual and audible notification appliances.

B. Visible Notification Appliances (Strobes):

1. Xenon strobe lights complying with UL 1971, 24-V dc nominal.
2. Rated Light Output: 15/30/75/110 cd, selectable in the field.
3. Flashing shall be in a temporal pattern, synchronized with other units. Maximum pulse duration: 0.2 seconds.
4. Clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" shall be engraved in minimum 1-inch high letters on the lens.
5. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
6. Strobe Leads: Factory connected to screw terminals.
7. Mounting Faceplate: Factory finished, color to match existing.

C. Audible Notification Appliances (Horns / Sounders):

1. Electric-vibrating-polarized type, 24-V dc nominal; with provision for housing the operating mechanism behind a grille.
2. Provide an ANSI S3.41 three-pulse temporal pattern audible signal, synchronized.
3. Horns shall produce a sound-pressure level of 90 dB, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol. Output sound level shall be 120 dB maximum.
4. Devices located outdoors shall be listed for us in wet locations.
5. Field programmable without the use of special tools.

2.7 ADDRESSABLE INTERFACE DEVICES

A. Control Modules:

1. For use in auxiliary control functions, operating as a dry contact relay.
2. Typical equipment control functions would include direct signals to: an elevator controller to initiate elevator recall, to a circuit-breaker shunt trip for power shutdown, or to a lighting control system for lighting control scenario under fire alarm conditions.
3. For use in supervising and controlling the operation of one NAC.
4. Provide an LED that flashes under normal conditions, indicating that the monitor module is operational and in regular communication with the FACU.

2.8 AUXILIARY POWER SUPPLIES

A. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module.

1. Alarm current draw of entire supplied circuitry loads shall not exceed 80 percent of the power-supply module rating.
2. 120V branch breaker shall be physically protected with a handle lock and identified with a ¼" diameter permanent red dot applied to the breaker handle or exposed body area.

B. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

1. Batteries:

a. Gel-cell, sealed, plate nickel cadmium, maintenance free.
b. Minimum of 60 hours standby capacity plus:

1) 5 minutes of horn/strobe full alarm load.

c. Add battery capacity for a 25% safety factor.

2. Charger: Dual-rate charging techniques for fast battery recharge.
3. Battery cabinet enclosures shall be twice the size of the batteries contained.

C. Auxiliary power supplies shall be individually monitored by the FACU and protected by a smoke detector.

D. Coordinate installation location with the Owner and Engineer. Do not install above ceilings or in non-conditioned spaces.

2.9 DIGITAL ALARM COMMUNICATOR TRANSMITTER (DACT)

A. Digital alarm communicator transmitter, 4-channel minimum, shall be compatible with and acceptable to the remote central station and shall comply with UL 632 and be listed and labeled by an NRTL.

B. Functional Performance:

1. Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture two telephone line(s) and dial a preset number for a central station, remote supervising station, or proprietary supervising station.
2. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line.
3. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.
4. Precedence of signals transmitted to the supervising station shall be: (1) Fire Alarm, (2) Supervisory Signal, (3) Trouble Signal, (4) Security Alarm.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:

1. Verification that both telephone lines are available.
2. Programming device.
3. LED display.
4. Manual test report function and manual transmission clear indication.
5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:

1. Address of the alarm-initiating device.
2. Address of the supervisory signal.
3. Address of the trouble-initiating device.
4. Loss of ac supply or loss of power.
5. Low battery.
6. Abnormal test signal.
7. Communication bus failure.

E. Secondary Power: Integral rechargeable battery and automatic charger.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

G. In lieu of a DACT, an addressable network is acceptable for signal transmission. If other means of signal transmission may be necessary, coordinate suitability with the AHJ.

2.10 SURGE PROTECTION

A. AC Input:

1. Mount in listed enclosure adjacent to branch circuit panelboard. Wind small coil (5 to 10 turns) in branch circuit conductor just downstream of the suppressor connection.
2. Install feed through branch circuit transient suppressor (Ditek #DTK-120S20A, Leviton #51020-WM/DIN, or approved equivalent that is UL 1449 2nd Edition Listed).

B. 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 #B280-24V, Ditek #DTK-2MHLP24B, Northern Technologies #DLP-42, Simplex #2081-9027/9028, Transtector #TSP8601.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Comply with NFPA 72 for installation of fire-alarm equipment.

B. Equipment and Device Mounting:

1. Install fire-alarm control unit with tops of cabinets not more than 72 inches above the finished floor.
2. Install equipment and 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.
3. Comply with requirements for seismic-restraint devices specified in Section "Vibration and Seismic Controls for Electrical Systems."

C. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.

1. Connect new equipment to new control panel in existing part of the building.
2. Connect new equipment to existing monitoring equipment at the supervising station.
3. Expand, modify, and supplement existing control and/or monitoring equipment as necessary to extend existing control and/or monitoring functions to the new points. New components shall be capable of merging with existing configuration without degrading the performance of either system.

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. 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.

F. 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.

G. 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.

H. Device Location-Indicating Lights: Locate in public space near the device they monitor.

3.2 REMOTE ALARM TRANSMISSION

A. The Contractor shall verify proper signal receipt by the supervising station.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section “Electrical Identification for ."

B. Detectors, appliances, and modules shall be labeled with unique numbers that are indicated on as-built drawings and permanently mounted on device bases. Continue labeling scheme of existing system installed. Labels shall be legible from floor level. Detectors shall be labeled uniquely and sequentially starting at the FACU with both SLC and 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.

E. Install framed basic operating instructions in a location visible from fire-alarm control unit. Optionally, with Owner concurrence, the instructions may be affixed to the inside of the FACU door.

F. Floor plans of the fire alarm system installation shall be provided at the FACU.

1. Provide a locked box adjacent to the FACU for plan book storage. Key to match FACU. Label lock box.
2. Floor plans shall include device locations and addresses. Indicate equipment, module, and EOL locations.
3. Provide a legend for symbols used.
4. A separate page shall be provided for each floor. Laminate individual pages and bind all pages in a book form.

G. NFPA 72 Record of Completion documentation shall be kept inside the FACU, or its kept location shall be permanently indicated inside the FACU on an engraved label.

H. At all equipment with a 120 VAC power source, provide an engraved label indicating panelboard ID, branch circuit number, and panelboard location. At the FACU, provide an additional engraved label inside the FACU.

3.4 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 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. Test mounting and anchorage devices according to requirements in Section "Seismic Controls for Electrical Work."
4. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
5. Test 100% of new alarm initiating devices, all software functions, all other system functions including DACT communication, and verify system operational matrix. Notify Owner and Engineer 2 weeks in advance of this test to permit witness observation.
6. Print a System Status and Programming Report with settings for each alarm indicating device, the current sensitivity of each analog addressable smoke detector, and detailed system operational matrix.
7. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion", NFPA 72, Figure 1-6.2.1 in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72. Submit "Fire Alarm System Record of Completion" to Engineer for delivery to Owner.
8. After 100% system test and submission of "Fire Alarm System Record of Completion", request Engineer to schedule an AHJ acceptance inspection, a minimum of 2 days after completion of system testing.

9. 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.

3.5 TRAINING / DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel for a minimum of 8 hours to adjust, operate, and maintain fire-alarm system. Training schedule must be coordinated to meet the Owner's schedule. Training location will be provided by the Owner.

B. As a minimum, training shall cover:

1. System software multiple access levels via password protection for accommodating Owner capability for disabling individual alarm inputs or normal outputs for alarms without modifying the system programming or affecting operation of the remainder of the system.

2. Overall system concepts, capabilities, and functions. Training shall be of sufficient detail so that the Owner shall be able to remove any device from service and return to service without the need for the Manufacturer's approval or assistance.

3. Methods and means of troubleshooting and replacement of all field wiring devices.

4. Methods and means of troubleshooting the main FACU and field devices for programming, bussing systems, internal panel and unit wiring, circuitry, and interconnections.

5. Preventative maintenance service techniques and schedules, including historical data trending of alarm and trouble records.

6. Training documentation and actual system software used for training shall be provided in digital form and left with the Owner at the completion of training.

C. Provide two bound copies of training information.

END OF SECTION 283111

SECTION 285000 – EMERGENCY RADIO COMMUNICATION ENHANCEMENT 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.

B. North Carolina State Highway Patrol document with information for Viper radio system call signs and locations of tower sites accessible within Brunswick County (attached for reference after this Section).

1.2 SUMMARY

A. Section Includes:

1. In-building radio signal amplification system.
2. A system shall be provided to cover the new building addition.

1.3 DEFINITIONS

A. AHJ Authority Having Jurisdiction

B. BDA Bi-Directional Amplifier: Device used to amplify band-selective or multi-band RF signals in the uplink, to the base station and in the downlink from the base station to subscriber devices for enhanced signals and improved coverage

C. DAS Distributed Antenna System

D. FCC Federal Communications Commission

E. RF Radio Frequency

1.4 ACTION SUBMITTALS

A. RF Surveys / Shop Drawings: Measurement drawings of each floor of the building which indicate relative RF field strength for each frequency and band of interest. Submit to both the AHJ and the Engineer.

1. Initial signal strength mapping. Perform an initial site survey to measure signal strength before construction starts.
2. Pre-final signal strength mapping. Perform a site survey to measure signal strength near substantial completion of the building.

B. Shop Drawings:

1. Include plans and details for code compliant, UL Listed, DAS system design for emergency responder radio coverage.

C. Product Data:

1. Include bill of materials for all BDA / DAS equipment and components.
2. Manufacturer product data sheets and cut sheets for all equipment and components.

D. Manufacturer Seismic Qualification Certification: Submit certification that poles, accessories, and components will withstand seismic forces defined in Section "Seismic Controls for Electrical Work." Include the following:

1. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
    a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified after the seismic event."
2. Dimensioned Drawings: Identify, locate, and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranty: Manufacturer's standard warranty.

1.6 CLOSEOUT SUBMITTALS

A. RF Survey / Shop Drawings: Final installed measurement drawings of each floor of the building which indicate relative RF field strength for each frequency and band of interest.

B. Operation and Maintenance Data: For all system equipment and components to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.8 WARRANTY

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Provide an in-building radio signal amplification system to provide complete coverage in the building for the public safety agencies. System shall meet the requirements of:
    1. The local AHJ.
    2. FCC.
    3. The North Carolina Fire Code.
    4. NFPA 72, National Fire Alarm and Signaling Code.
    5. NFPA 1221, Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems.
    6. UL 2524, Standard for In-building 2-Way Emergency Radio Communication Enhancement Systems.

B. Seismic Performance: System equipment and components shall withstand the effects of earthquake motions.

PART 3 - EXECUTION

3.1 RF FIELD SURVEYS

A. Perform initial field survey to determine that a system is required due to inadequate radio signal coverage.

B. Perform pre-design field surveys to determine signal strength data required to perform designs.

3.2 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. Install system equipment and components.

B. Coordinate infrastructure needs for system installation.

3.4 IDENTIFICATION

A. Identify and mark equipment and components with engraved labels as specified in Section “Electrical Identification”.

3.5 FIELD QUALITY CONTROL

A. Manufacturer’s Field Service: Engage a factory-authorized service representative to:

1. Test and adjust equipment and components.
2. Perform startup and commissioning of system.

B. Tests and Inspections:

1. Perform final testing for the local inspection authority, including final signal strength mapping.
2. Perform final testing and demonstration with the AHJ.
3. Submit final signal strength mapping results shop drawings.

END OF SECTION 285000

Contact	
NORTH CAROLINA STATE HIGHWAY PATROL WAYNE E EBERHARD 4231 MAIL SERVICE CENTER RALEIGH, NC 27699-4231 ATTN Wayne E Eberhard	P:(919)948-7854 F:(919)662-4444 E:WAYNE.EBERHARD@NCDPS.GOV

Call Signs and Locations of Tower Sites Accessible Within Brunswick County

WQRB685 Bolivia, NC

WQUA258 Southport, NC

WQFQ491 Pea Landing, Ash NC

WQTB690 Supply, NC

WPUT648 Delco, NC

WQXV212 Nakina, NC

WQTA409 Wilmington, NC

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FCC Callsign WQRB685 (NORTH CAROLINA STATE HIGHWAY PATROL)

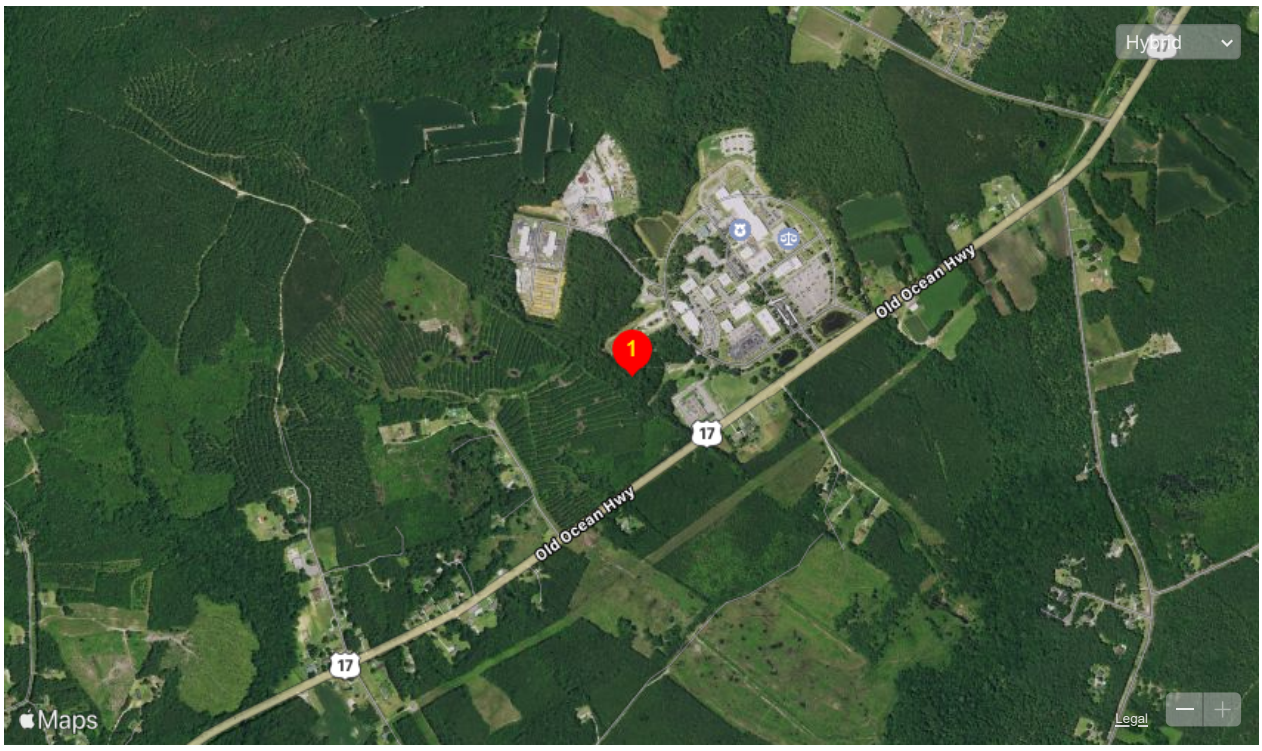
Licensee Name:	NORTH CAROLINA STATE HIGHWAY PATROL
License:	WQRB685
FRN:	0001913888
Status:	Active (Effective: 10/14/2016 - Expires: 04/10/2023)
County:	BRUNSWICK
State:	NC
Radio Service:	YE: Public Safety/Spec Emerg and Public Safety Ntl Plan, 806-817/851
Notes:	LAW ENFORCEMENT AND PUBLICE SAFETY ACTIVITIES ON TRUNKED RADIO



Access Radio Online
Listen to Live Radio with Easy Radio Play

Easy Radio Player

#	Tower ID	Type	Ant Height	Struc Height	Elevation	Address
1	1064532	GTOWER	152.4	152.4	12.8	HP-1031, BOLIVIA, 85 GOVERNMENT CENTER DRIVE
2			0.0	0.0	0.0	



Hot Hot

Loc #	Frequency	Emission	Class	Units	Pag	Pwr	Lat	Long	City	County	State
1	851.08750000	8K30F1W	FB2C	1	0	100.000	34.05500	-78.16722	BOLIVIA	BRUNSWICK	NC
1	851.08750000	9K80D7W	FB2C	1	0	100.000	34.05500	-78.16722	BOLIVIA	BRUNSWICK	NC
1	851.73750000	9K80D7W	FB2C	1	0	100.000	34.05500	-78.16722	BOLIVIA	BRUNSWICK	NC
1	851.73750000	8K30F1W	FB2C	1	0	100.000	34.05500	-78.16722	BOLIVIA	BRUNSWICK	NC
1	852.17500000	8K30F1W	FB2C	1	0	100.000	34.05500	-78.16722	BOLIVIA	BRUNSWICK	NC
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1	852.37500000	8K30F1W	FB2C	1	0	100.000	34.05500	-78.16722	BOLIVIA	BRUNSWICK	NC
1	852.37500000	9K80D7W	FB2C	1	0	100.000	34.05500	-78.16722	BOLIVIA	BRUNSWICK	NC
1	852.62500000	9K80D7W	FB2C	1	0	100.000	34.05500	-78.16722	BOLIVIA	BRUNSWICK	NC
1	852.62500000	8K30F1W	FB2C	1	0	100.000	34.05500	-78.16722	BOLIVIA	BRUNSWICK	NC
1	852.87500000	8K30F1W	FB2C	1	0	100.000	34.05500	-78.16722	BOLIVIA	BRUNSWICK	NC
1	852.87500000	9K80D7W	FB2C	1	0	100.000	34.05500	-78.16722	BOLIVIA	BRUNSWICK	NC
1	853.37500000	8K30F1W	FB2C	1	0	100.000	34.05500	-78.16722	BOLIVIA	BRUNSWICK	NC
1	853.37500000	9K80D7W	FB2C	1	0	100.000	34.05500	-78.16722	BOLIVIA	BRUNSWICK	NC
1	853.87500000	9K80D7W	FB2C	1	0	100.000	34.05500	-78.16722	BOLIVIA	BRUNSWICK	NC
1	853.87500000	8K30F1W	FB2C	1	0	100.000	34.05500	-78.16722	BOLIVIA	BRUNSWICK	NC
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1	856.68750000	8K30F1W	FB2C	1	0	100.000	34.05500	-78.16722	BOLIVIA	BRUNSWICK	NC
2	806.08750000	8K30F1W	MO	950	0	35.000					
2	806.08750000	9K80D7W	MO	950	0	35.000					
2	806.73750000	9K80D7W	MO	950	0	35.000					
2	806.73750000	8K30F1W	MO	950	0	35.000					
2	807.17500000	8K30F1W	MO	950	0	35.000					
2	807.17500000	9K80D7W	MO	950	0	35.000					
2	807.37500000	9K80D7W	MO	950	0	35.000					
2	807.37500000	8K30F1W	MO	950	0	35.000					
2	807.62500000	8K30F1W	MO	950	0	35.000					
2	807.62500000	9K80D7W	MO	950	0	35.000					
2	807.87500000	8K30F1W	MO	950	0	35.000					
2	807.87500000	9K80D7W	MO	950	0	35.000					
2	808.37500000	9K80D7W	MO	950	0	35.000					
2	808.37500000	8K30F1W	MO	950	0	35.000					
2	808.87500000	8K30F1W	MO	950	0	35.000					
2	808.87500000	9K80D7W	MO	950	0	35.000					
2	811.68750000	8K30F1W	MO	950	0	35.000					
2	811.68750000	9K80D7W	MO	950	0	35.000					

FCC ULS Listing for this callsign

FCC Data Last Updated On: 10-17-2019 04:39

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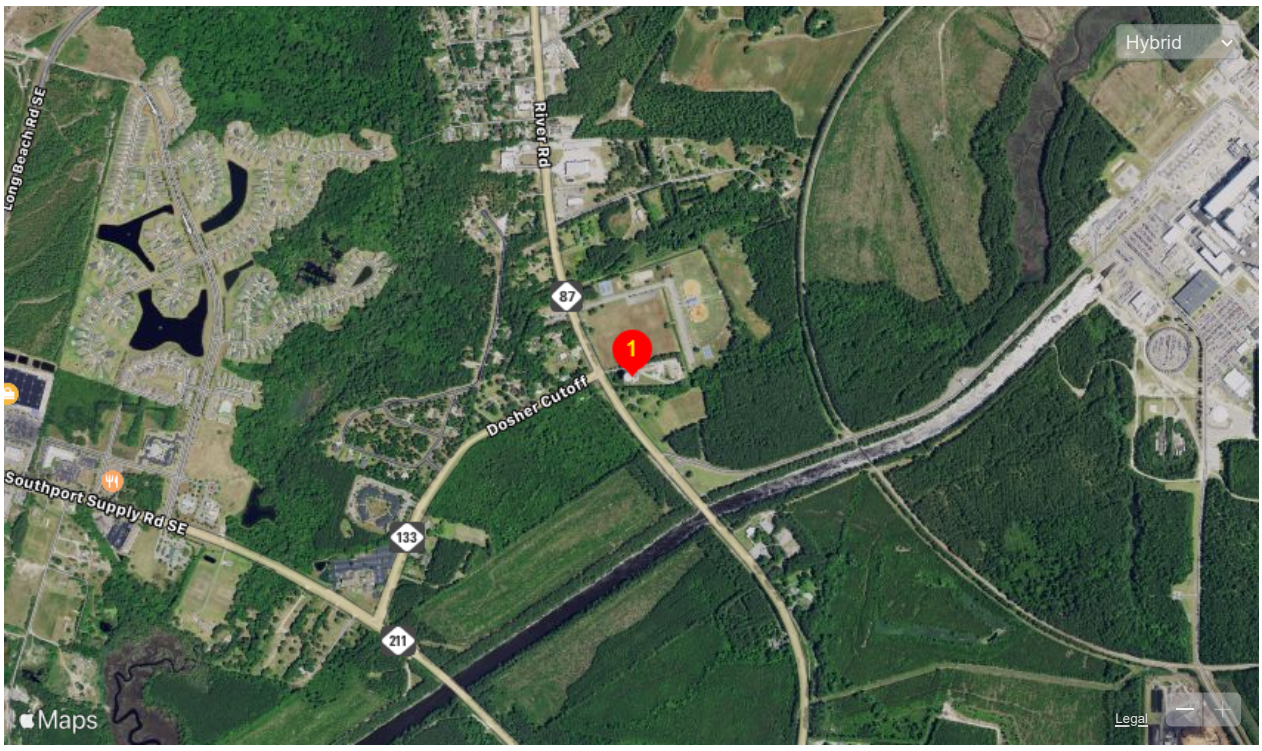
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FCC Callsign WQUA258 (North Carolina State Highway Patrol)

Licensee Name:	North Carolina State Highway Patrol
License:	WQUA258
FRN:	0001913888
Status:	Active (Effective: 07/20/2016 - Expires: 05/19/2024)
County:	BRUNSWICK
State:	NC
Radio Service:	SY: Trunked Public Safety 700MHz
Notes:	LAW ENFORCEMENT AND PUBLIC SAFETY ACTIVITIES ON 700 MHZ.



#	Tower ID	Type	Ant Height	Struc Height	Elevation	Address
1	1299443	TANK	46.5	47.8	7.6	HP-1263, SOUTHPORT WT, 8400 RIVER ROAD 28461
2			0.0	0.0	0.0	



Hot

Loc #	Frequency	Emission	Class	Units	Pag	Pwr	Lat	Long	City	County	State
1	769.31875000	9K80D7W	FB2C	1	0	100.000	33.95414	-78.02758	SOUTHPORT	BRUNSWICK	NC
1	769.31875000	8K30F1W	FB2C	1	0	100.000	33.95414	-78.02758	SOUTHPORT	BRUNSWICK	NC
1	769.61875000	8K30F1W	FB2C	1	0	100.000	33.95414	-78.02758	SOUTHPORT	BRUNSWICK	NC
1	769.61875000	9K80D7W	FB2C	1	0	100.000	33.95414	-78.02758	SOUTHPORT	BRUNSWICK	NC
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1	770.81875000	8K30F1W	FB2C	1	0	100.000	33.95414	-78.02758	SOUTHPORT	BRUNSWICK	NC
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1	771.69375000	9K80D7W	FB2C	1	0	100.000	33.95414	-78.02758	SOUTHPORT	BRUNSWICK	NC
1	771.94375000	9K80D7W	FB2C	1	0	100.000	33.95414	-78.02758	SOUTHPORT	BRUNSWICK	NC
1	771.94375000	8K30F1W	FB2C	1	0	100.000	33.95414	-78.02758	SOUTHPORT	BRUNSWICK	NC
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1	773.89375000	8K30F1W	FB2C	1	0	100.000	33.95414	-78.02758	SOUTHPORT	BRUNSWICK	NC
1	773.89375000	9K80D7W	FB2C	1	0	100.000	33.95414	-78.02758	SOUTHPORT	BRUNSWICK	NC
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2	799.31875000	8K30F1W	MO	4800	0	30.000					
2	799.61875000	8K30F1W	MO	4800	0	30.000					
2	799.61875000	9K80D7W	MO	4800	0	30.000					
2	800.81875000	9K80D7W	MO	4800	0	30.000					
2	800.81875000	8K30F1W	MO	4800	0	30.000					
2	801.69375000	9K80D7W	MO	4800	0	30.000					
2	801.69375000	8K30F1W	MO	4800	0	30.000					
2	801.94375000	8K30F1W	MO	4800	0	30.000					
2	801.94375000	9K80D7W	MO	4800	0	30.000					
2	802.36875000	9K80D7W	MO	4800	0	30.000					
2	802.36875000	8K30F1W	MO	4800	0	30.000					
2	802.74375000	9K80D7W	MO	4800	0	30.000					
2	802.74375000	8K30F1W	MO	4800	0	30.000					
2	802.99375000	8K30F1W	MO	4800	0	30.000					
2	802.99375000	9K80D7W	MO	4800	0	30.000					
2	803.44375000	9K80D7W	MO	4800	0	30.000					
2	803.44375000	8K30F1W	MO	4800	0	30.000					
2	803.89375000	8K30F1W	MO	4800	0	30.000					
2	803.89375000	9K80D7W	MO	4800	0	30.000					

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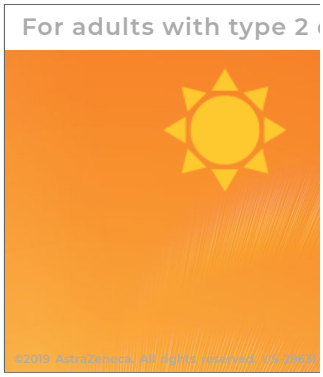
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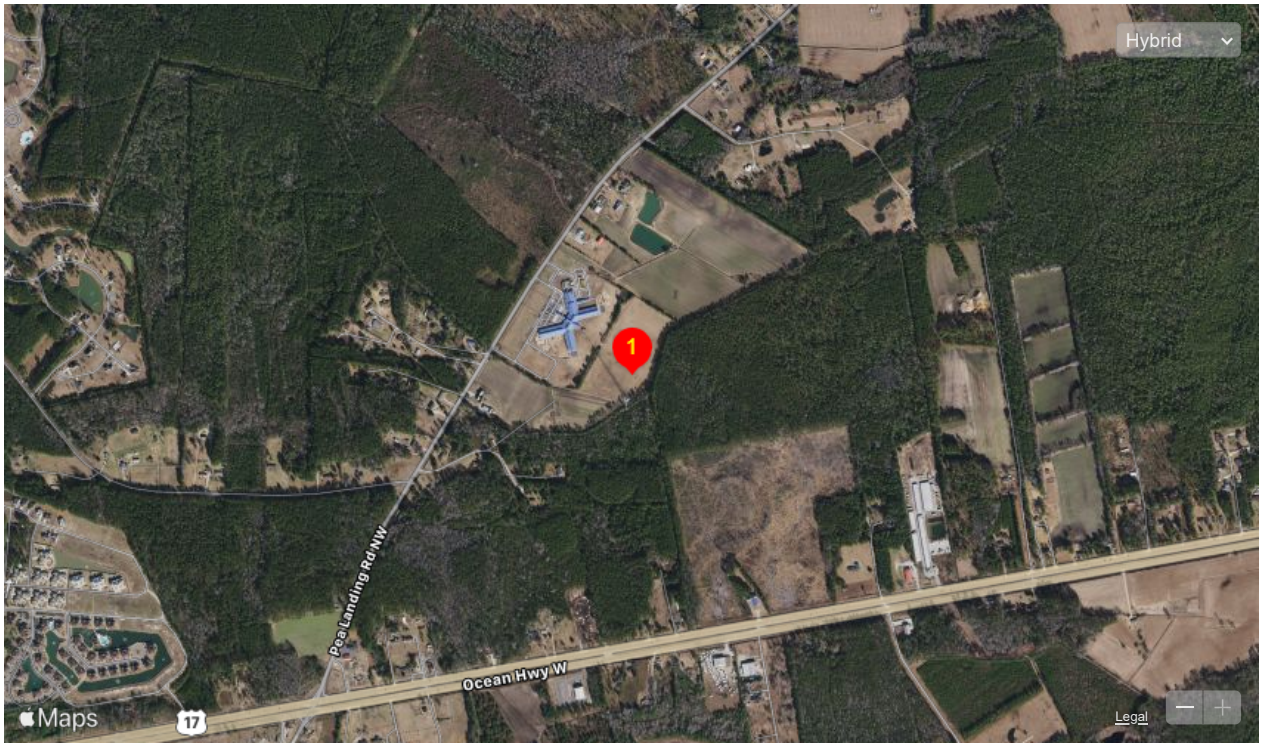
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FCC Callsign WQFQ491 (NORTH CAROLINA STATE HIGHWAY PATROL)

Licensee Name:	NORTH CAROLINA STATE HIGHWAY PATROL
License:	WQFQ491
FRN:	0001913888
Status:	Active (Effective: 07/08/2016 - Expires: 09/08/2026)
County:	BRUNSWICK
State:	NC
Radio Service:	YE: Public Safety/Spec Emerg and Public Safety Ntl Plan, 806-817/851
Notes:	POLICE ACTIVITY OVER TRUNKED RADIO CHANNELS



#	Tower ID	Type	Ant Height	Struc Height	Elevation	Address
1	1253659	LTOWER	121.9	125.0	12.1	HP-1202, PEA LANDING, 250 PEA LANDING ROAD
2			0.0	0.0	0.0	



Hot

Loc #	Frequency	Emission	Class	Units	Pag	Pwr	Lat	Long	City	County	State
1	851.03750000	8K30F1W	FB2C	1	0	100.000	33.94650	-78.54611	THOMASBORO	BRUNSWICK	NC
1	851.03750000	20K0F1E	FB2C	1	0	100.000	33.94650	-78.54611	THOMASBORO	BRUNSWICK	NC
1	851.03750000	9K80D7W	FB2C	1	0	100.000	33.94650	-78.54611	THOMASBORO	BRUNSWICK	NC
1	851.03750000	20K0F3E	FB2C	1	0	100.000	33.94650	-78.54611	THOMASBORO	BRUNSWICK	NC
1	851.55000000	8K30F1W	FB2C	1	0	100.000	33.94650	-78.54611	THOMASBORO	BRUNSWICK	NC
1	851.55000000	20K0F1E	FB2C	1	0	100.000	33.94650	-78.54611	THOMASBORO	BRUNSWICK	NC
1	851.55000000	9K80D7W	FB2C	1	0	100.000	33.94650	-78.54611	THOMASBORO	BRUNSWICK	NC
1	851.55000000	20K0F3E	FB2C	1	0	100.000	33.94650	-78.54611	THOMASBORO	BRUNSWICK	NC
1	851.85000000	20K0F1E	FB2C	1	0	100.000	33.94650	-78.54611	THOMASBORO	BRUNSWICK	NC
1	851.85000000	9K80D7W	FB2C	1	0	100.000	33.94650	-78.54611	THOMASBORO	BRUNSWICK	NC
1	851.85000000	20K0F3E	FB2C	1	0	100.000	33.94650	-78.54611	THOMASBORO	BRUNSWICK	NC
1	851.85000000	8K30F1W	FB2C	1	0	100.000	33.94650	-78.54611	THOMASBORO	BRUNSWICK	NC
1	852.15000000	20K0F3E	FB2C	1	0	100.000	33.94650	-78.54611	THOMASBORO	BRUNSWICK	NC
1	852.15000000	8K30F1W	FB2C	1	0	100.000	33.94650	-78.54611	THOMASBORO	BRUNSWICK	NC
1	852.15000000	20K0F1E	FB2C	1	0	100.000	33.94650	-78.54611	THOMASBORO	BRUNSWICK	NC
1	852.15000000	9K80D7W	FB2C	1	0	100.000	33.94650	-78.54611	THOMASBORO	BRUNSWICK	NC
1	852.38750000	8K30F1W	FB2C	1	0	100.000	33.94650	-78.54611	THOMASBORO	BRUNSWICK	NC
1	852.38750000	20K0F1E	FB2C	1	0	100.000	33.94650	-78.54611	THOMASBORO	BRUNSWICK	NC
1	852.38750000	9K80D7W	FB2C	1	0	100.000	33.94650	-78.54611	THOMASBORO	BRUNSWICK	NC
1	852.38750000	20K0F3E	FB2C	1	0	100.000	33.94650	-78.54611	THOMASBORO	BRUNSWICK	NC
1	852.71250000	20K0F1E	FB2C	1	0	100.000	33.94650	-78.54611	THOMASBORO	BRUNSWICK	NC
1	852.71250000	9K80D7W	FB2C	1	0	100.000	33.94650	-78.54611	THOMASBORO	BRUNSWICK	NC
1	852.71250000	20K0F3E	FB2C	1	0	100.000	33.94650	-78.54611	THOMASBORO	BRUNSWICK	NC
1	852.71250000	8K30F1W	FB2C	1	0	100.000	33.94650	-78.54611	THOMASBORO	BRUNSWICK	NC
1	853.67500000	8K30F1W	FB2C	1	0	100.000	33.94650	-78.54611	THOMASBORO	BRUNSWICK	NC
1	853.67500000	20K0F1E	FB2C	1	0	100.000	33.94650	-78.54611	THOMASBORO	BRUNSWICK	NC
1	853.67500000	9K80D7W	FB2C	1	0	100.000	33.94650	-78.54611	THOMASBORO	BRUNSWICK	NC
1	853.67500000	20K0F3E	FB2C	1	0	100.000	33.94650	-78.54611	THOMASBORO	BRUNSWICK	NC
2	806.03750000	9K80D7W	MO	750	0	35.000					
2	806.03750000	20K0F3E	MO	750	0	35.000					
2	806.03750000	8K30F1W	MO	750	0	35.000					
2	806.03750000	20K0F1E	MO	750	0	35.000					
2	806.55000000	20K0F3E	MO	750	0	35.000					
2	806.55000000	8K30F1W	MO	750	0	35.000					
2	806.55000000	20K0F1E	MO	750	0	35.000					
2	806.55000000	9K80D7W	MO	750	0	35.000					
2	806.85000000	8K30F1W	MO	750	0	35.000					
2	806.85000000	20K0F1E	MO	750	0	35.000					
2	806.85000000	9K80D7W	MO	750	0	35.000					
2	806.85000000	20K0F3E	MO	750	0	35.000					
2	807.15000000	20K0F1E	MO	750	0	35.000					
2	807.15000000	9K80D7W	MO	750	0	35.000					
2	807.15000000	20K0F3E	MO	750	0	35.000					
2	807.15000000	8K30F1W	MO	750	0	35.000					
2	807.38750000	20K0F3E	MO	750	0	35.000					
2	807.38750000	8K30F1W	MO	750	0	35.000					
2	807.38750000	20K0F1E	MO	750	0	35.000					
2	807.38750000	9K80D7W	MO	750	0	35.000					
2	807.71250000	8K30F1W	MO	750	0	35.000					
2	807.71250000	20K0F1E	MO	750	0	35.000					
2	807.71250000	9K80D7W	MO	750	0	35.000					
2	807.71250000	20K0F3E	MO	750	0	35.000					

2	808.67500000	9K80D7W	MO	750	0	35.000					
2	808.67500000	20K0F3E	MO	750	0	35.000					
2	808.67500000	8K30F1W	MO	750	0	35.000					
2	808.67500000	20K0F1E	MO	750	0	35.000					

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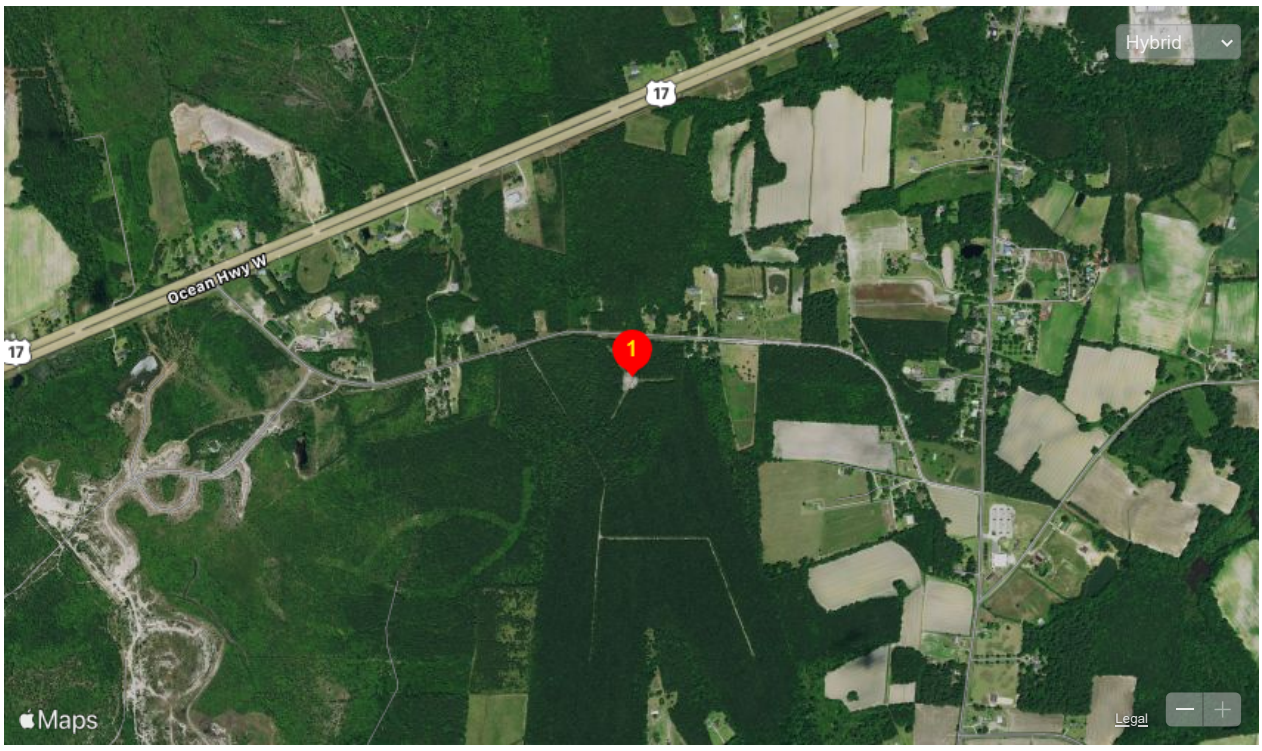
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FCC Callsign WQTB690 (NORTH CAROLINA STATE HIGHWAY PATROL)

Licensee Name:	NORTH CAROLINA STATE HIGHWAY PATROL
License:	WQTB690
FRN:	0001913888
Status:	Active (Effective: 06/20/2017 - Expires: 12/30/2023)
County:	BRUNSWICK
State:	NC
Radio Service:	YE: Public Safety/Spec Emerg and Public Safety Ntl Plan, 806-817/851
Notes:	APPLICANT IS A GOVERNMENT ENTITY WHICH PROVIDES COMMUNICATIONS ESSENTIAL TO ITS OFFICIAL ACTIVITIES.

Great Brands. Gr

#	Tower ID	Type	Ant Height	Struc Height	Elevation	Address
1	1008872	GTOWER	143.9	149.4	14.1	HP-1273, SUPPLY, 329 CUMBEE ROAD SW
2			0.0	0.0	0.0	





Loc #	Frequency	Emission	Class	Units	Pag	Pwr	Lat	Long	City	County	State
1	851.16250000	8K30F1W	FB2C	1	0	100.000	33.99667	-78.31278	SUPPLY	BRUNSWICK	NC
1	851.16250000	9K80D7W	FB2C	1	0	100.000	33.99667	-78.31278	SUPPLY	BRUNSWICK	NC
1	851.58750000	8K30F1W	FB2C	1	0	100.000	33.99667	-78.31278	SUPPLY	BRUNSWICK	NC
1	851.58750000	9K80D7W	FB2C	1	0	100.000	33.99667	-78.31278	SUPPLY	BRUNSWICK	NC
1	852.08750000	9K80D7W	FB2C	1	0	100.000	33.99667	-78.31278	SUPPLY	BRUNSWICK	NC
1	852.08750000	8K30F1W	FB2C	1	0	100.000	33.99667	-78.31278	SUPPLY	BRUNSWICK	NC
1	852.58750000	8K30F1W	FB2C	1	0	100.000	33.99667	-78.31278	SUPPLY	BRUNSWICK	NC
1	852.58750000	9K80D7W	FB2C	1	0	100.000	33.99667	-78.31278	SUPPLY	BRUNSWICK	NC
1	853.08750000	9K80D7W	FB2C	1	0	100.000	33.99667	-78.31278	SUPPLY	BRUNSWICK	NC
1	853.08750000	8K30F1W	FB2C	1	0	100.000	33.99667	-78.31278	SUPPLY	BRUNSWICK	NC
1	853.61250000	8K30F1W	FB2C	1	0	100.000	33.99667	-78.31278	SUPPLY	BRUNSWICK	NC
1	853.61250000	9K80D7W	FB2C	1	0	100.000	33.99667	-78.31278	SUPPLY	BRUNSWICK	NC
2	806.16250000	9K80D7W	MO	800	0	35.000					
2	806.16250000	8K30F1W	MO	800	0	35.000					
2	806.58750000	8K30F1W	MO	800	0	35.000					
2	806.58750000	9K80D7W	MO	800	0	35.000					
2	807.08750000	8K30F1W	MO	800	0	35.000					
2	807.08750000	9K80D7W	MO	800	0	35.000					
2	807.58750000	9K80D7W	MO	800	0	35.000					
2	807.58750000	8K30F1W	MO	800	0	35.000					
2	808.08750000	8K30F1W	MO	800	0	35.000					
2	808.08750000	9K80D7W	MO	800	0	35.000					
2	808.61250000	9K80D7W	MO	800	0	35.000					
2	808.61250000	8K30F1W	MO	800	0	35.000					

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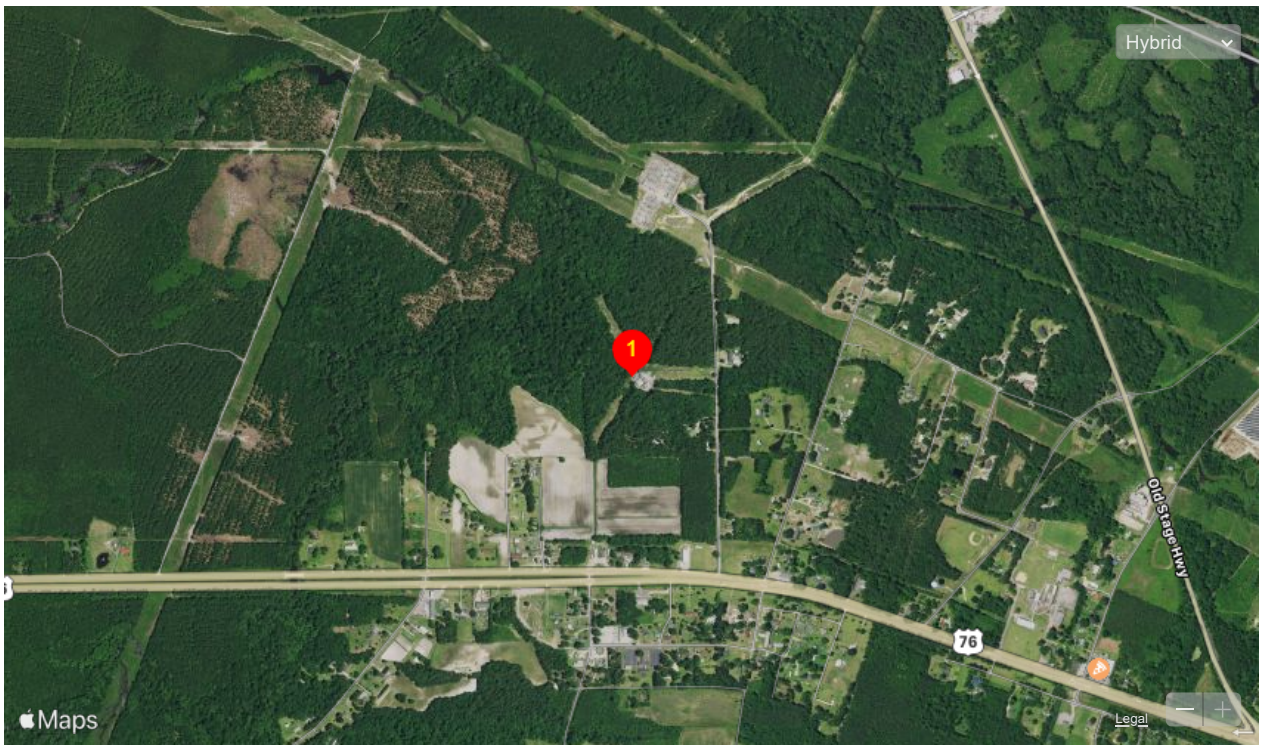


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FCC Callsign WPUT648 (NORTH CAROLINA STATE HIGHWAY PATROL)

Licensee Name:	NORTH CAROLINA STATE HIGHWAY PATROL
License:	WPUT648
FRN:	0001913888
Status:	Active (Effective: 06/30/2016 - Expires: 04/30/2022)
County:	COLUMBUS
State:	NC
Radio Service:	YE: Public Safety/Spec Emerg and Public Safety Ntl Plan, 806-817/851
Notes:	POLICE ACTIVITIES ON TRUNKED RADIO CHANNELS

#	Tower ID	Type	Ant Height	Struc Height	Elevation	Address
1	1014589	GTOWER	293.2	310.9	8.8	HP-1068, DELCO, 521 TV TOWER ROAD
2			0.0	0.0	0.0	



Hot

Loc #	Frequency	Emission	Class	Units	Pag	Pwr	Lat	Long	City	County	State
1	851.25000000	8K30F1W	FB2C	1	0	100.000	34.32128	-78.22833	RIEGELWOOD	COLUMBUS	NC
1	851.25000000	9K80D7W	FB2C	1	0	100.000	34.32128	-78.22833	RIEGELWOOD	COLUMBUS	NC
1	851.46250000	8K30F1W	FB2C	1	0	100.000	34.32128	-78.22833	RIEGELWOOD	COLUMBUS	NC
1	851.46250000	9K80D7W	FB2C	1	0	100.000	34.32128	-78.22833	RIEGELWOOD	COLUMBUS	NC
1	851.75000000	9K80D7W	FB2C	1	0	100.000	34.32128	-78.22833	RIEGELWOOD	COLUMBUS	NC
1	851.75000000	8K30F1W	FB2C	1	0	100.000	34.32128	-78.22833	RIEGELWOOD	COLUMBUS	NC
1	852.23750000	8K30F1W	FB2C	1	0	100.000	34.32128	-78.22833	RIEGELWOOD	COLUMBUS	NC
1	852.23750000	9K80D7W	FB2C	1	0	100.000	34.32128	-78.22833	RIEGELWOOD	COLUMBUS	NC
1	852.73750000	8K30F1W	FB2C	1	0	100.000	34.32128	-78.22833	RIEGELWOOD	COLUMBUS	NC
1	852.73750000	9K80D7W	FB2C	1	0	100.000	34.32128	-78.22833	RIEGELWOOD	COLUMBUS	NC
1	853.25000000	9K80D7W	FB2C	1	0	100.000	34.32128	-78.22833	RIEGELWOOD	COLUMBUS	NC
1	853.25000000	8K30F1W	FB2C	1	0	100.000	34.32128	-78.22833	RIEGELWOOD	COLUMBUS	NC
1	853.51250000	8K30F1W	FB2C	1	0	100.000	34.32128	-78.22833	RIEGELWOOD	COLUMBUS	NC
1	853.51250000	9K80D7W	FB2C	1	0	100.000	34.32128	-78.22833	RIEGELWOOD	COLUMBUS	NC
1	853.75000000	8K30F1W	FB2C	1	0	100.000	34.32128	-78.22833	RIEGELWOOD	COLUMBUS	NC
1	853.75000000	9K80D7W	FB2C	1	0	100.000	34.32128	-78.22833	RIEGELWOOD	COLUMBUS	NC
2	806.25000000	9K80D7W	MO	5000	0	35.000					
2	806.25000000	8K30F1W	MO	5000	0	35.000					
2	806.46250000	8K30F1W	MO	5000	0	35.000					
2	806.46250000	9K80D7W	MO	5000	0	35.000					
2	806.75000000	8K30F1W	MO	5000	0	35.000					
2	806.75000000	9K80D7W	MO	5000	0	35.000					
2	807.23750000	9K80D7W	MO	5000	0	35.000					
2	807.23750000	8K30F1W	MO	5000	0	35.000					
2	807.73750000	8K30F1W	MO	5000	0	35.000					
2	807.73750000	9K80D7W	MO	5000	0	35.000					
2	808.25000000	8K30F1W	MO	5000	0	35.000					
2	808.25000000	9K80D7W	MO	5000	0	35.000					
2	808.51250000	9K80D7W	MO	5000	0	35.000					
2	808.51250000	8K30F1W	MO	5000	0	35.000					
2	808.75000000	9K80D7W	MO	5000	0	35.000					
2	808.75000000	8K30F1W	MO	5000	0	35.000					

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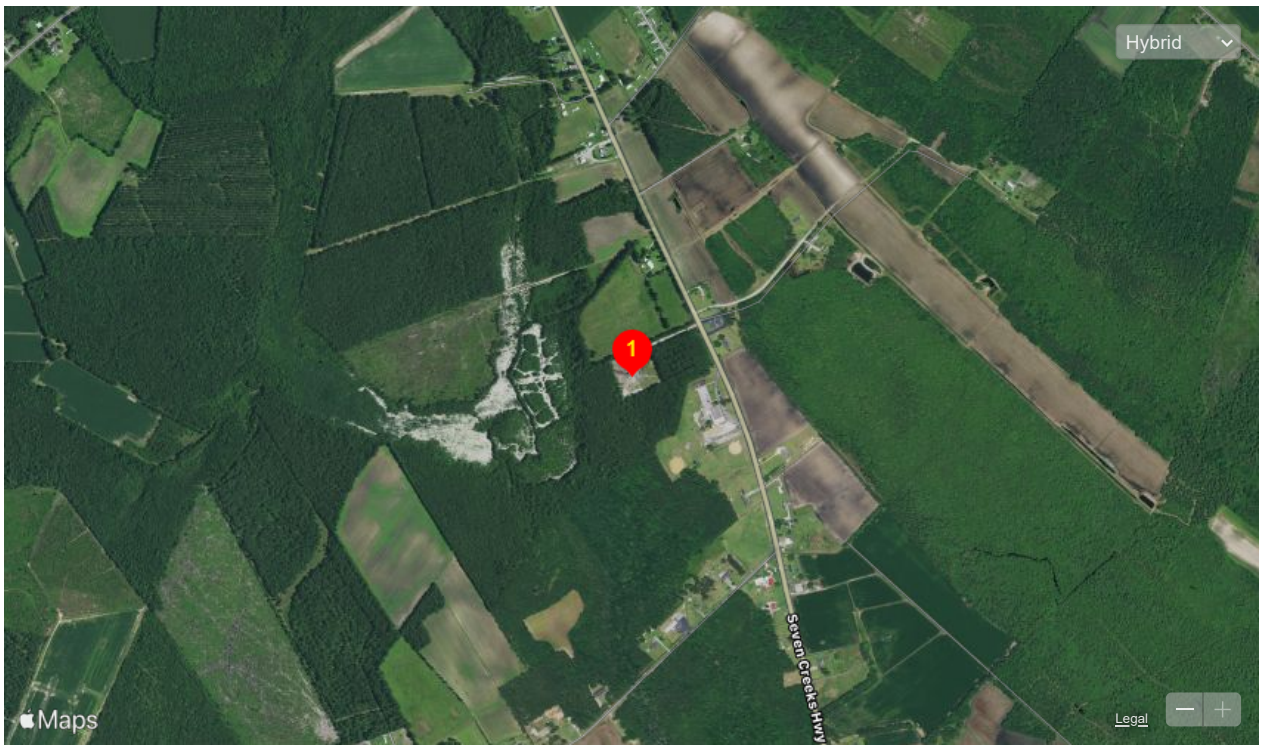
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FCC Callsign WQXV212 (NORTH CAROLINA STATE HIGHWAY PATROL)

Licensee Name:	NORTH CAROLINA STATE HIGHWAY PATROL
License:	WQXV212
FRN:	0001913888
Status:	Active (Effective: 06/17/2016 - Expires: 06/17/2026)
County:	COLUMBUS
State:	NC
Radio Service:	SY: Trunked Public Safety 700MHz
Notes:	LAW ENFORCEMENT AND PUBLIC SAFETY ACTIVITIES ON TRUNKED RADIO



#	Tower ID	Type	Ant Height	Struc Height	Elevation	Address
1	1298551	LTOWER	115.8	121.6	13.4	HP-1182, NAKINA, 9822 SEVEN CREEKS HIGHWAY 28455
2			0.0	0.0	0.0	



Hot

Loc #	Frequency	Emission	Class	Units	Pag	Pwr	Lat	Long	City	County	State
1	769.80625000	9K80D7W	FB2C	1	0	100.000	34.10883	-78.65669	NAKINA	COLUMBUS	NC
1	769.80625000	8K30F1W	FB2C	1	0	100.000	34.10883	-78.65669	NAKINA	COLUMBUS	NC
1	770.28125000	8K30F1W	FB2C	1	0	100.000	34.10883	-78.65669	NAKINA	COLUMBUS	NC
1	770.28125000	9K80D7W	FB2C	1	0	100.000	34.10883	-78.65669	NAKINA	COLUMBUS	NC
1	770.75625000	8K30F1W	FB2C	1	0	100.000	34.10883	-78.65669	NAKINA	COLUMBUS	NC
1	770.75625000	9K80D7W	FB2C	1	0	100.000	34.10883	-78.65669	NAKINA	COLUMBUS	NC
1	771.05625000	9K80D7W	FB2C	1	0	100.000	34.10883	-78.65669	NAKINA	COLUMBUS	NC
1	771.05625000	8K30F1W	FB2C	1	0	100.000	34.10883	-78.65669	NAKINA	COLUMBUS	NC
1	771.30625000	8K30F1W	FB2C	1	0	100.000	34.10883	-78.65669	NAKINA	COLUMBUS	NC
1	771.30625000	9K80D7W	FB2C	1	0	100.000	34.10883	-78.65669	NAKINA	COLUMBUS	NC
1	771.58125000	9K80D7W	FB2C	1	0	100.000	34.10883	-78.65669	NAKINA	COLUMBUS	NC
1	771.58125000	8K30F1W	FB2C	1	0	100.000	34.10883	-78.65669	NAKINA	COLUMBUS	NC
2	799.80625000	8K30F1W	MO	4800	0	30.000					
2	799.80625000	9K80D7W	MO	4800	0	30.000					
2	800.28125000	9K80D7W	MO	4800	0	30.000					
2	800.28125000	8K30F1W	MO	4800	0	30.000					
2	800.75625000	8K30F1W	MO	4800	0	30.000					
2	800.75625000	9K80D7W	MO	4800	0	30.000					
2	801.05625000	9K80D7W	MO	4800	0	30.000					
2	801.05625000	8K30F1W	MO	4800	0	30.000					
2	801.30625000	8K30F1W	MO	4800	0	30.000					
2	801.30625000	9K80D7W	MO	4800	0	30.000					
2	801.58125000	8K30F1W	MO	4800	0	30.000					
2	801.58125000	9K80D7W	MO	4800	0	30.000					

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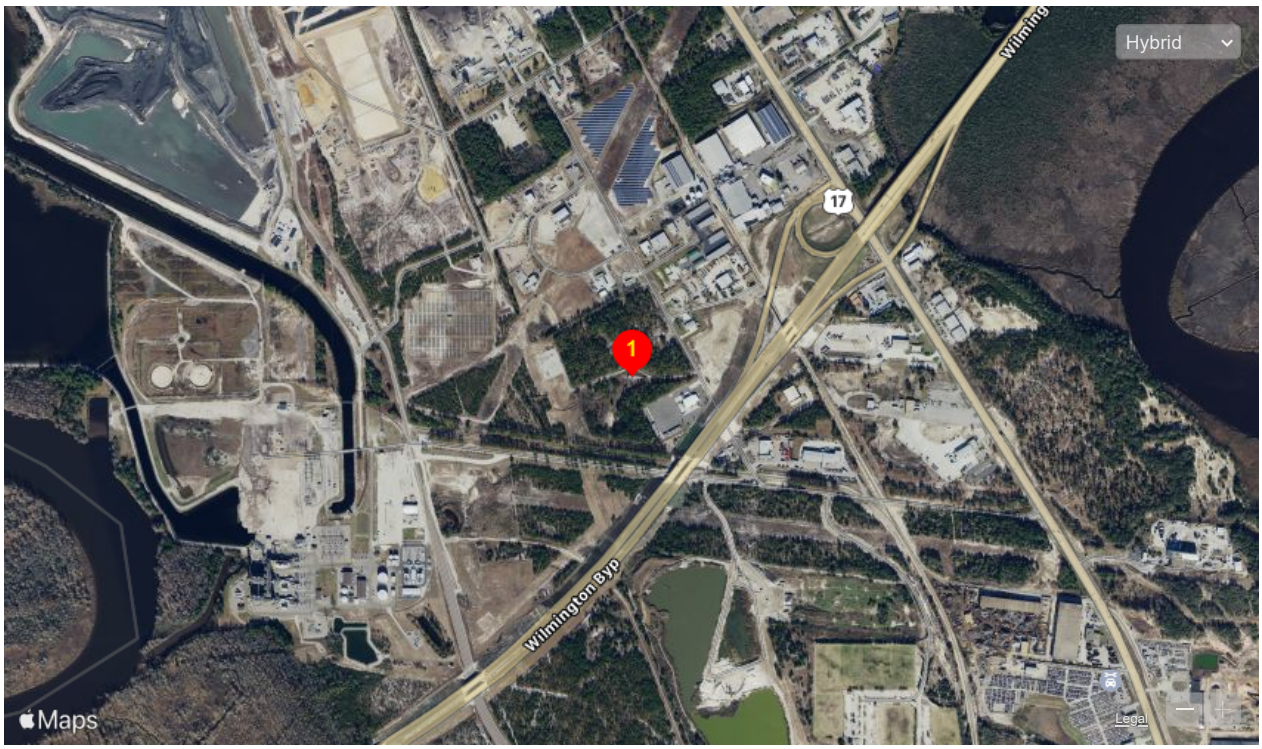


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FCC Callsign WQTA409 (NORTH CAROLINA STATE HIGHWAY PATROL)

Licensee Name:	NORTH CAROLINA STATE HIGHWAY PATROL
License:	WQTA409
FRN:	0001913888
Status:	Active (Effective: 02/06/2014 - Expires: 12/18/2023)
County:	NEW HANOVER
State:	NC
Radio Service:	YE: Public Safety/Spec Emerg and Public Safety Ntl Plan, 806-817/851
Notes:	APPLICANT IS A GOVERNMENT ENTITY WHICH PROVIDES COMMUNICATIONS ESSENTIAL TO ITS OFFICIAL ACTIVITIES.

#	Tower ID	Type	Ant Height	Struc Height	Elevation	Address
1	1012165	GTOWER	176.7	180.4	3.9	HP-1100, FLEMINGTON, 3405 FREDERICKSON ROAD
3			0.0	0.0	0.0	



▷ ×

Loc #	Frequency	Emission	Class	Units	Pag	Pwr	Lat	Long	City	County	State
1	851.12500000	8K30F1W	FB2C	1	0	100.000	34.28583	-77.97528	WILMINGTON	NEW HANOVER	NC
1	851.12500000	20K0F1E	FB2C	1	0	100.000	34.28583	-77.97528	WILMINGTON	NEW HANOVER	NC
1	851.12500000	9K80D7W	FB2C	1	0	100.000	34.28583	-77.97528	WILMINGTON	NEW HANOVER	NC
1	851.12500000	20K0F3E	FB2C	1	0	100.000	34.28583	-77.97528	WILMINGTON	NEW HANOVER	NC
1	851.37500000	20K0F1E	FB2C	1	0	100.000	34.28583	-77.97528	WILMINGTON	NEW HANOVER	NC
1	851.37500000	9K80D7W	FB2C	1	0	100.000	34.28583	-77.97528	WILMINGTON	NEW HANOVER	NC
1	851.37500000	20K0F3E	FB2C	1	0	100.000	34.28583	-77.97528	WILMINGTON	NEW HANOVER	NC
1	851.37500000	8K30F1W	FB2C	1	0	100.000	34.28583	-77.97528	WILMINGTON	NEW HANOVER	NC
1	851.63750000	20K0F3E	FB2C	1	0	100.000	34.28583	-77.97528	WILMINGTON	NEW HANOVER	NC
1	851.63750000	8K30F1W	FB2C	1	0	100.000	34.28583	-77.97528	WILMINGTON	NEW HANOVER	NC
1	851.63750000	20K0F1E	FB2C	1	0	100.000	34.28583	-77.97528	WILMINGTON	NEW HANOVER	NC
1	851.63750000	9K80D7W	FB2C	1	0	100.000	34.28583	-77.97528	WILMINGTON	NEW HANOVER	NC
1	851.81250000	8K30F1W	FB2C	1	0	100.000	34.28583	-77.97528	WILMINGTON	NEW HANOVER	NC
1	851.81250000	20K0F1E	FB2C	1	0	100.000	34.28583	-77.97528	WILMINGTON	NEW HANOVER	NC
1	851.81250000	9K80D7W	FB2C	1	0	100.000	34.28583	-77.97528	WILMINGTON	NEW HANOVER	NC
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1	852.06250000	9K80D7W	FB2C	1	0	100.000	34.28583	-77.97528	WILMINGTON	NEW HANOVER	NC
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1	852.13750000	20K0F1E	FB2C	1	0	100.000	34.28583	-77.97528	WILMINGTON	NEW HANOVER	NC
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1	852.81250000	9K80D7W	FB2C	1	0	100.000	34.28583	-77.97528	WILMINGTON	NEW HANOVER	NC
1	852.81250000	20K0F3E	FB2C	1	0	100.000	34.28583	-77.97528	WILMINGTON	NEW HANOVER	NC
1	853.12500000	8K30F1W	FB2C	1	0	100.000	34.28583	-77.97528	WILMINGTON	NEW HANOVER	NC
1	853.12500000	20K0F1E	FB2C	1	0	100.000	34.28583	-77.97528	WILMINGTON	NEW HANOVER	NC
1	853.12500000	9K80D7W	FB2C	1	0	100.000	34.28583	-77.97528	WILMINGTON	NEW HANOVER	NC
1	853.12500000	20K0F3E	FB2C	1	0	100.000	34.28583	-77.97528	WILMINGTON	NEW HANOVER	NC
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1	853.58750000	20K0F3E	FB2C	1	0	100.000	34.28583	-77.97528	WILMINGTON	NEW HANOVER	NC
1	853.58750000	8K30F1W	FB2C	1	0	100.000	34.28583	-77.97528	WILMINGTON	NEW HANOVER	NC
3	806.12500000	20K0F3E	MO	1050	0	35.000					
3	806.12500000	8K30F1W	MO	1050	0	35.000					
3	806.12500000	20K0F1E	MO	1050	0	35.000					
3	806.12500000	9K80D7W	MO	1050	0	35.000					
3	806.37500000	8K30F1W	MO	1050	0	35.000					
3	806.37500000	20K0F1E	MO	1050	0	35.000					
3	806.37500000	9K80D7W	MO	1050	0	35.000					
3	806.37500000	20K0F3E	MO	1050	0	35.000					
3	806.63750000	20K0F1E	MO	1050	0	35.000					
3	806.63750000	9K80D7W	MO	1050	0	35.000					
3	806.63750000	20K0F3E	MO	1050	0	35.000					
3	806.63750000	8K30F1W	MO	1050	0	35.000					

3	806.81250000	9K80D7W	MO	1050	0	35.000					
3	806.81250000	20K0F3E	MO	1050	0	35.000					
3	806.81250000	8K30F1W	MO	1050	0	35.000					
3	806.81250000	20K0F1E	MO	1050	0	35.000					
3	807.06250000	20K0F3E	MO	1050	0	35.000					
3	807.06250000	8K30F1W	MO	1050	0	35.000					
3	807.06250000	20K0F1E	MO	1050	0	35.000					
3	807.06250000	9K80D7W	MO	1050	0	35.000					
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3	807.13750000	20K0F1E	MO	1050	0	35.000					
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3	807.81250000	9K80D7W	MO	1050	0	35.000					
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3	807.81250000	20K0F1E	MO	1050	0	35.000					
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3	808.12500000	8K30F1W	MO	1050	0	35.000					
3	808.12500000	20K0F1E	MO	1050	0	35.000					
3	808.12500000	9K80D7W	MO	1050	0	35.000					
3	808.58750000	8K30F1W	MO	1050	0	35.000					
3	808.58750000	20K0F1E	MO	1050	0	35.000					
3	808.58750000	9K80D7W	MO	1050	0	35.000					
3	808.58750000	20K0F3E	MO	1050	0	35.000					

FCC ULS Listing for this callsign

FCC Data Last Updated On: 10-17-2019 04:39

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SECTION 31 1000

SITE CLEARING

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. Protecting existing vegetation to remain.
   2. Removing existing vegetation.
   3. Clearing and grubbing.
   4. Stripping and stockpiling topsoil.
   5. Removing above- and below-grade site improvements.
   6. Temporary erosion and sedimentation control.

B. Related Requirements:
   1. Section 015000 "Temporary Facilities and Controls" for temporary erosion- and sedimentation-control measures.

C. Related Requirements:
   1. Section 01500 "Temporary Facilities and Controls" for temporary erosion- and sedimentation-control measures.

1.3 DEFINITIONS

A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow.

D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

E. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.

F. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.6 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
   1. Use sufficiently detailed photographs or video recordings.
   2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.

B. Topsoil stripping and stockpiling program.

C. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.7 QUALITY ASSURANCE

A. Topsoil Stripping and Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

1.8 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
   1. Do not proceed with work on adjoining property until directed by Architect.

C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and tree-protection measures are in place.

E. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."
   1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and installed.

C. Protect existing site improvements to remain from damage during construction.
   1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

A. Protect trees and plants remaining on-site according to the plans.

B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations.

3.4 EXISTING UTILITIES

A. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Architect not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Architect's written permission.

B. Removal of underground utilities is included in earthwork sections; in applicable fire suppression, plumbing, HVAC, electrical, communications, electronic safety and security, and utilities sections; and in Section 024116 "Structure Demolition" and Section 024119 "Selective Demolition."

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
   1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
   2. Grind down stumps and remove roots larger than 2 inches in diameter, obstructions, and debris to a depth of 18 inches below exposed subgrade.
   3. Use only hand methods or air spade for grubbing within protection zones.
   4. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
   1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth of 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.
   1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.
   1. Limit height of topsoil stockpiles to 72 inches.
   2. Do not stockpile topsoil within protection zones.
   3. Dispose of surplus topsoil.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
   1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
   2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Burning tree, shrub, and other vegetation waste is not permitted. Burning of other waste and debris is prohibited.

C. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION

SECTION 31 2000

EARTH MOVING

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. Excavating and filling for rough grading the Site.
2. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses, and plants.
3. Excavating and backfilling for buildings and structures.
4. Drainage course for concrete slabs-on-grade.
5. Subbase course for concrete walks and pavements.
6. Subbase course and base course for asphalt paving.
7. Subsurface drainage backfill for walls and trenches.
8. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Requirements:
1. Section 311000 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
2. Section 315000 "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.
3. Section 329200 "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.
4. Section 329300 "Plants" for finish grading in planting areas and tree and shrub pit excavation and planting.
5. ECS Southeast, LLP Geotechnical Engineering Report titled “Brunswick County Court House Addition” ECS Project Number #22:26623 dated May 7, 2018 is made a part of this specification and is included for reference.

1.3 UNIT PRICES

A. Work of this Section is affected by unit prices for earth moving specified in Section 012200 "Unit Prices."

B. Quantity allowances for earth moving are included in Section 012100 "Allowances."

1.4 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation

and replacement material will be paid for according to Contract provisions for unit prices or changes in the Work.

2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct pre-excavation conference at Project site.
1. Review methods and procedures related to earthmoving, including, but not limited to, the following:
   a. Personnel and equipment needed to make progress and avoid delays.
   b. Coordination of Work with utility locator service.
   c. Coordination of Work and equipment movement with the locations of tree- and plant-protection zones.
   d. Extent of trenching by hand or with air spade.
   e. Field quality control.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:
1. Geotextiles.
2. Controlled low-strength material, including design mixture.
3. Geofoam.
4. Warning tapes.

B. Samples for Verification: For the following products, in sizes indicated below:
1. Geotextile: 12 by 12 inches.
2. Warning Tape: 12 inches long; of each color.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:
1. Classification SM, SC, SW, SP, GW, GP, GM and GC or a combination of these soils according to ASTM D2487.
2. Laboratory compaction curve according to ASTM D698.

C. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

1.8 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E329 and ASTM D3740 for testing indicated.

1.9 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
   1. Do not proceed with work on adjoining property until directed by Architect.

C. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations.

D. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in Section 311000 "Site Clearing" are in place.

E. The following practices are prohibited within protection zones:
   1. Storage of construction materials, debris, or excavated material.
   2. Parking vehicles or equipment.
   3. Foot traffic.
   4. Erection of sheds or structures.
   5. Impoundment of water.
   6. Excavation or other digging unless otherwise indicated.
   7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

F. Do not direct vehicle or equipment exhaust towards protection zones.

G. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups SM, SC. SW. SP, GW, GP, GM AND GC according to ASTM D2487, or a combination of these groups; free of rock or gravel larger than 4 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
   1. Liquid Limit: 35 maximum.
   2. Plasticity Index: 9 maximum.
   3. Maximum percent of fines passing #200 sieve is 20.

C. Unsatisfactory Soils: Soil Classification Groups CL, ML, OL, CH, MH, OH, and PT according to ASTM D2487, or a combination of these groups.
   1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.

I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and zero to 5 percent passing a No. 4 sieve.

J. Sand: ASTM C33/C33M; fine aggregate.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
   1. Survivability: Class 2; AASHTO M 288.
   2. Survivability: As follows:
      a. Grab Tensile Strength: 157 lbf; ASTM D4632.
      b. Sewn Seam Strength: 142 lbf; ASTM D4632.
      c. Tear Strength: 56 lbf; ASTM D4533.
      d. Puncture Strength: 56 lbf; ASTM D4833.
   3. Apparent Opening Size: No. 40 sieve, maximum; ASTM D4751.
   4. Permittivity: 0.5 per second, minimum; ASTM D4491.
   5. UV Stability: 50 percent after 500 hours' exposure; ASTM D4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
   1. Survivability: Class 2; AASHTO M 288.
   2. Survivability: As follows:
      a. Grab Tensile Strength: 247 lbf; ASTM D4632.
      b. Sewn Seam Strength: 222 lbf; ASTM D4632.
      c. Tear Strength: 90 lbf; ASTM D4533.
      d. Puncture Strength: 90 lbf; ASTM D4833.
   3. Apparent Opening Size: No. 60 sieve, maximum; ASTM D4751.
   4. Permittivity: 0.02 per second, minimum; ASTM D4491.
   5. UV Stability: 50 percent after 500 hours' exposure; ASTM D4355.

2.3 CONTROLLED LOW-STRENGTH MATERIAL

A. Controlled Low-Strength Material: Self-compacting, low-density, flowable concrete material produced from the following:
   1. Portland Cement: ASTM C150, Type I.
   2. Fly Ash: ASTM C618, Class C or F.
   3. Normal-Weight Aggregate: ASTM C33, 3/8-inch nominal maximum aggregate size.
   4. Foaming Agent: ASTM C869.
   5. Water: ASTM C94.
   6. Air-Entraining Admixture: ASTM C260.

B. Produce conventional-weight, controlled low-strength material with 80-psi compressive strength when tested according to ASTM C495.

2.4 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Provide dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

B. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

D. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.

3.3 EXPLOSIVES

A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
   a. 24 inches outside of concrete forms other than at footings.
   b. 12 inches outside of concrete forms at footings.
   c. 6 inches outside of minimum required dimensions of concrete cast against grade.

d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
e. 6 inches beneath bottom of concrete slabs-on-grade.
f. 6 inches beneath pipe in trenches and the greater of 24 inches wider than pipe or 42 inches wide.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:
1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.
1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
1. Clearance: 12 inches each side of pipe or conduit.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
1. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
4. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

E. Trenches in Tree- and Plant-Protection Zones:
1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.8 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices or changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.
1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.10 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:
1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring, bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 033000 "Cast-in-Place Concrete."

D. Trenches under Roadways: Provide 4-inch thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course. Concrete is specified in Section 033000 "Cast-in-Place Concrete."

E. Backfill voids with satisfactory soil while removing shoring and bracing.

F. Initial Backfill:
   1. Soil Backfill: Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
      a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
   2. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the pipe or conduit. Coordinate backfilling with utilities testing.

G. Final Backfill:
   1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
   2. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.

H. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.13 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:
   1. Under grass and planted areas, use satisfactory soil material.
   2. Under walks and pavements, use satisfactory soil material.
   3. Under steps and ramps, use engineered fill.
   4. Under building slabs, use engineered fill.
   5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.14 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
   1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
   2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D698:
   1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 98 percent.
   2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 98 percent.
   3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.
   4. For utility trenches, compact each layer of initial and final backfill soil material at 95 percent.

3.16 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
   1. Provide a smooth transition between adjacent existing grades and new grades.
   2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
   1. Turf or Unpaved Areas: Plus or minus 1 inch.
   2. Walks: Plus or minus 1 inch
   3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.17 SUBSURFACE DRAINAGE

A. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
   1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D698.

B. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
   1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D698.
   2. Place and compact impervious fill over drainage backfill in 6-inch-thick compacted layers to final subgrade.

3.18 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
   1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
   2. Place base course material over subbase course under hot-mix asphalt pavement.
   3. Shape subbase course and base course to required crown elevations and cross-slope grades.
   4. Place subbase course and base course 6 inches or less in compacted thickness in a single layer.

5. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
6. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 98 percent of maximum dry unit weight according to ASTM D698.

C. Pavement Shoulders: Place shoulders along edges of subbase course and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 98 percent of maximum dry unit weight according to ASTM D698.

3.19 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place drainage course 6 inches or less in compacted thickness in a single layer.
3. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 98 percent of maximum dry unit weight according to ASTM D698.

3.20 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material classification and maximum lift thickness comply with requirements.
3. Determine, during placement and compaction, that in-place density of compacted fill complies with requirements.

B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

E. Testing agency will test compaction of soils in place according to ASTM D1556, ASTM D2167, ASTM D2937, and ASTM D6938, as applicable. Tests will be performed at the following locations and frequencies:
1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2500 sq. ft. or less of paved area or building slab but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 100 feet or less of trench length but no fewer than two tests.

F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.21 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
   1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
   1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.
   1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION

SECTION 31 2319

DEWATERING

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 construction dewatering.

B. Related Requirements:
   1. Section 312000 "Earth Moving" for excavating, backfilling, site grading, and controlling surface-water runoff and ponding.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Verify availability of Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   2. Review condition of site to be dewatered including coordination with temporary erosion-control measures and temporary controls and protections.
   3. Review geotechnical report.
   4. Review proposed site clearing and excavations.
   5. Review existing utilities and subsurface conditions.
   6. Review observation and monitoring of dewatering system.

1.4 ACTION SUBMITTALS

A. Shop Drawings: For dewatering system, prepared by or under the supervision of a qualified professional engineer.
   1. Include plans, elevations, sections, and details.
   2. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.
   3. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.
   4. Include written plan for dewatering operations including sequence of well and well-point placement coordinated with excavation shoring and bracings and control procedures to be adopted if dewatering problems arise.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports.

C. Existing Conditions: Using photographs or video recordings, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by dewatering operations. Submit before Work begins.

D. Record Drawings: Identify locations and depths of capped wells and well points and other abandoned-in-place dewatering equipment.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer that has specialized in design of dewatering systems and dewatering work.

1.7 FIELD CONDITIONS

A. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical

engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from this data.

1. Make additional test borings and conduct other exploratory operations necessary for dewatering according to the performance requirements.
2. The geotechnical report is referenced elsewhere in Project Manual.

B. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

1. Design dewatering system, including comprehensive engineering analysis by a qualified professional engineer.
2. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, prevention of flooding in excavation, and prevention of damage to subgrades and permanent structures.
3. Prevent surface water from entering excavations by grading, dikes, or other means.
4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
5. Remove dewatering system when no longer required for construction.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with water- and debris-disposal regulations of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.

1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site or surrounding area.
2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Provide temporary grading to facilitate dewatering and control of surface water.

D. Protect and maintain temporary erosion and sedimentation controls, which are specified in Section 311000 "Site Clearing," during dewatering operations.

3.2 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

1. Space well points or wells at intervals required to provide sufficient dewatering.
2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.

B. Place dewatering system into operation to lower water to specified levels before excavating below ground-water level.

C. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

D. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.3 OPERATION

A. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.

B. Operate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.
   1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
   2. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
   3. Maintain piezometric water level a minimum of 24 inches below bottom of excavation.

C. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.

D. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.

3.4 FIELD QUALITY CONTROL

A. Observation Wells: Provide observation wells or piezometers, take measurements, and maintain at least the minimum number indicated; additional observation wells may be required by authorities having jurisdiction.
   1. Observe and record daily elevation of ground water and piezometric water levels in observation wells.
   2. Repair or replace, within 24 hours, observation wells that become inactive, damaged, or destroyed. In areas where observation wells are not functioning properly, suspend construction activities until reliable observations can be made. Add or remove water from observation-well risers to demonstrate that observation wells are functioning properly.
   3. Fill observation wells, remove piezometers, and fill holes when dewatering is completed.

B. Survey-Work Benchmarks: Resurvey benchmarks regularly during dewatering and maintain an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

C. Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.

D. Prepare reports of observations.

3.5 PROTECTION

A. Protect and maintain dewatering system during dewatering operations.

B. Promptly repair damages to adjacent facilities caused by dewatering.

END OF SECTION

SECTION 31 3116

TERMITE CONTROL

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. Soil treatment.

B. Related Requirements:
   1. Section 061000 "Rough Carpentry" for wood preservative treatment by pressure process.
   2. Section 076200 "Sheet Metal Flashing and Trim" for custom-fabricated, metal termite shields.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components, and profiles for termite control products.
   2. Include the EPA-Registered Label for termiticide products.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For each type of termite control product.

C. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's records and include the following:
   1. Date and time of application.
   2. Moisture content of soil before application.
   3. Termiticide brand name and manufacturer.
   4. Quantity of undiluted termiticide used.
   5. Dilutions, methods, volumes used, and rates of application.
   6. Areas of application.
   7. Water source for application.

D. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located and who employs workers trained and approved by manufacturer to install manufacturer's products.

1.7 FIELD CONDITIONS

A. Soil Treatment:
   1. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.
   2. Related Work: Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.8 WARRANTY

A. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work consisting of applied soil termiticide treatment will prevent infestation of subterranean termites, including Formosan termites (Coptotermes formosanus). If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
   1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain termite control products from single source from single manufacturer.

2.2 SOIL TREATMENT

A. Termiticide: EPA-Registered termiticide acceptable to authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. BASF Corporation.
      b. Bayer Environmental Science.
      c. Ensystex, Inc.
   2. Service Life of Treatment: Soil treatment termiticide that is effective for not less than five years against infestation of subterranean termites.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil per termiticide label, interfaces with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.

B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Prepare work areas according to the requirements of authorities having jurisdiction and according to manufacturer's written instructions before beginning application and installation of termite control treatment(s). Remove extraneous sources of wood cellulose and other edible materials, such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.
   1. Fit filling hose connected to water source at the site with a backflow preventer, according to requirements of authorities having jurisdiction.

3.3 APPLYING SOIL TREATMENT

A. Application: Mix soil treatment termiticide solution to a uniform consistency. Distribute treatment uniformly. Apply treatment at the product's EPA-Registered Label volume and rate for maximum specified concentration of termiticide to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction.
   1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
   2. Foundations: Soil adjacent to and along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit

penetrating the slab; around interior column footers, piers, and chimney bases; and along the entire outside perimeter, from grade to bottom of footing.

3. Crawlspaces: Soil under and adjacent to foundations. Treat adjacent areas, including around entrance platform, porches, and equipment bases. Apply overall treatment only where attached concrete platform and porches are on fill or ground.
4. Masonry: Treat voids.
5. Penetrations: At expansion joints, control joints, and areas where slabs and below-grade walls will be penetrated.

B. Post warning signs in areas of application.

C. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

3.4 PROTECTION

A. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

B. Protect termiticide solution dispersed in treated soils and fills from being diluted by exposure to water spillage or weather until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

3.5 MAINTENANCE SERVICE

A. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of termite-control-treatment Installer. Include annual maintenance as required for proper performance according to the product's EPA-Registered Label and manufacturer's written instructions. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

B. Continuing Maintenance Proposal: Provide from termite-control-treatment Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

1. Include annual inspection for termite activity and effectiveness of termite treatment according to manufacturer's written instructions.

END OF SECTION

SECTION 31 6316
AUGER CAST GROUT PILES

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 auger cast grout piles.

1.3 UNIT PRICES

A. Contract Sum: Base Contract Sum on number and dimensions of piles from tip to pile top.

B. Work of this Section is affected as follows:

1. Pile Length: Additional payment for pile lengths in excess of that indicated, and credit for pile lengths less than that indicated, is calculated at unit prices stated in the Contract, based on net addition or deduction to total pile length as determined by Architect and measured to nearest 12 inches (305 mm).
2. Number of Piles: Additional payment for number of piles in excess of that indicated, and credit for number of piles less than that indicated, is calculated at unit prices stated in the Contract.
3. Unit prices include labor, materials, tools, equipment, and incidentals for excavation, grout fill, reinforcement, testing and inspection, and other items for complete pile installation.
4. No payment is made for rejected piles, including piles out of specified tolerance or defective piles.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each grout mixture. Submit alternative design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Shop Drawings: For auger cast grout piles, prepared by or under the supervision of a qualified professional engineer.

1. Identify each pile and indicate pile dimensions, cross sections, locations, and sizes.
2. Indicate types and configurations of reinforcement and detail fabricating.
3. Detail connections to pile caps.
4. Include method of centralizing reinforcement, type and size of centralizing devices, and locations on reinforcing bars.
5. Submit structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Material Certificates: For the following:

1. Cementitious materials.

2. Concrete admixtures.
3. Steel reinforcing.

D. Equipment Data: Description of drilling and grout-pumping equipment including the following:
1. Type and make of drilling rig, rated capacity, and boom lengths.
2. Torque of drilling machine and horsepower of hydraulic power unit.
3. Pressure and discharge capacity of grout pump.
4. Automated monitoring equipment to be used.

E. Static Pile Test Reports: Submit within three days of completing each test.

F. Pile Inspection Reports: Submit not later than the morning of the next working day after placing each pile.

G. Certified Piles Survey: Submit within seven days of completion.

H. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Record Drawings.

B. Certified Pile Survey: Submit within seven days of pile installation completion.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C1077, ASTM D3740, and ASTM E329 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.

B. Mix Designs: For each type of grout. Include description of type and proportions of ingredients.

C. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."

1.9 FIELD CONDITIONS

A. Protect structures, underground utilities, and other construction from damage caused by pile excavation.

B. Site Information: A geotechnical report has been prepared for this Project and is referenced elsewhere in the Project Manual for information only.

C. Survey Work: Engage a qualified land surveyor or professional engineer to perform surveys, layouts, and measurements for auger cast grout piles. Before excavating, lay out each pile to lines and levels required. Record actual measurements of each pile's location, shaft diameter, bottom and top elevations, deviations from specified tolerances, and other specified data.
1. Record and maintain information pertinent to each pile and indicate on record Drawings. Cooperate with Owner's testing and inspecting agency to provide data for required reports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design piles, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
1. Design Loads: As indicated on Drawings.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60 (Grade 420), deformed.

B. Single Bar Reinforcing: ASTM A722/A722M, high strength, threaded.

1. Mechanical Couplings: Screw-on type, capable of supporting the minimum ultimate tensile strength of the coupled bars.

C. Centralizers: Devices to center steel reinforcement in excavation; spaced not less than 20 feet (6 m) o.c. for vertical piles.

2.3 CONCRETE MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I/II.

1. Fly Ash: ASTM C618, Class F.

B. Fine Aggregate: ASTM C33/C33M with 100 percent passing a No. 8 (2.36-mm) sieve, free of materials with deleterious reactivity to alkali in cement. Provide aggregate from single source.

C. Water: ASTM C94/C94M and potable.

D. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
3. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
4. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

E. Fluidifier: ASTM C937, with expansion of less than 4 percent.

2.4 RELATED MATERIALS

A. Pile-Top Forms: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes. Provide units with enough wall thickness to resist plastic concrete loads without detrimental deformation. Diameter same as pile diameter.

2.5 GROUT MIXTURES

A. Prepare design mixtures for each type and strength of grout, proportioned on the basis of laboratory trial mixture, field test data, or both.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Proportion grout mixture as follows:

1. Minimum Compressive Strength: 5000 psi (34.5 MPa) at 28 days; ASTM C109/C109M with cube specimens restrained from expansion according to ASTM C942.
2. Maximum Water-Cementitious Materials Ratio: 0.43.
3. Grout Flow: 10 to 25 seconds; ASTM C939 and ASTM C109/C109M using a flow cone with 0.75-inch (19-mm) opening.

2.6 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.7 GROUT MIXING

A. Ready-Mixed Grout: Measure, batch, mix, and deliver according to ASTM C94/C94M, and furnish batch ticket information.

1. Temperature Limits: Comply with ACI 305.1 for hot weather and ACI 306.1 for cold weather.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, and other hazards created by drilling operations.

B. Rough grade ground elevation at pile locations to a minimum of 12 inches (305 mm) above required cutoff elevation.

3.2 DRILLING AND PUMPING EQUIPMENT

A. Drilling Rig: Capable of advancing hollow-stem, continuous-flight augers of design diameters to depths 20 percent greater than design depths; with stabilizing arm at bottom of leads to prevent rotation, and middle guide for augers greater than 40 feet (12 m) in length.

1. Mark leads at maximum 60-inch (1500-mm) intervals to facilitate measurement of penetration.

B. Hollow-Stem Auger: Continuous auger flighting without gaps or breaks, of diameter no more than 3 percent less than pile diameter; with grout pumping hole at bottom of auger head below cutting teeth. Seal grout-pumping hole with temporary tip plug to be fully opened by grout pressure or reinforcing bar during grout installation.

1. Hollow Shaft Diameter: Minimum 1-1/4-inch (32-mm) clear ID.

C. Grout Pump: Positive-displacement pump with a known volume per stroke. Minimum displacement pressure at pump of 350 lbf/sq. in. (2.4 MPa).

D. Automated Monitoring Equipment: Capable of measuring auger depth, penetration rate, and grout volume pumped per unit depth increment and of printing results.

3.3 EXCAVATION

A. Prevent surface water from entering excavated shafts. Conduct water to site drainage facilities.

B. Advance auger at a continuous rate during insertion that prevents removal of excess soil.

C. Excavate piles to elevations indicated. Establish and maintain axial alignment of leads and shaft before and during driving.

1. Auger Refusal: Rate of less than 1 fpm (0.3 m/s).

D. Drilling Tolerances:

1. Location: Pile centers maximum 3 inches (75 mm) from locations indicated.
2. Plumb: Within 2 percent from vertical.
3. Batter Angle: Within 4 percent from required angle.

3.4 INSTALLATION

A. Maintain positive (clockwise) rotation of auger during withdrawal. Promptly remove excavated spoils to prevent accumulation.

B. Grout Placement: Place grout in continuous operation.

1. Lift auger 6 to 12 inches (152 to 305 mm) at start of grout pumping to facilitate tip plug removal, then return to previously established tip elevation.
2. Develop an initial grout head of 60 inches (1500 mm) before start of auger withdrawal and maintain during extraction.
3. Monitor pumped grout volumes using automated monitoring equipment.
4. Volume of placed grout is at least 115 percent of theoretical volume. If less than required volume is placed for any given 60-inch (1500-mm) segment, lower auger a minimum of 60 inches (1500 mm), or to bottom of pile if less than 60 inches (1500 mm) available, and restart withdrawal.
5. If grout pumping is interrupted during placement, lower auger a minimum of 60 inches (1500 mm), or to bottom of pile if less than 60 inches (1500 mm) available, and restart withdrawal.

C. Steel Reinforcement Installation, General: Comply with recommendations in CRSI's "Manual of Standard Practice."

1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy bond with grout.
2. Screen pile top to remove spoils immediately after auger withdrawal and before placing reinforcement.

D. Single Bar Reinforcing: Install through center of hollow-stem auger before grout placement.

E. Reinforcing Cages: Install immediately after grout placement and support at ground surface until initial set. Allow cages to fall into shaft freely under their own weight; do not force by vibrating or pushing with mechanical equipment.

F. Adjacent Piles: Do not install piles within 6 pile diameters of piles grouted within the previous 12 hours.

G. Pile Completion:

1. Where cutoff elevation is above the ground elevation, form top section above grade and extend shaft to required elevation with pile-top form.

2. Where cutoff elevation is below the ground elevation, cut off top of piles at elevations indicated by removing fresh grout from the top of pile or cutting off hardened pile top after initial set.

H. If location or out-of-plumb tolerances are exceeded, provide corrective construction. Submit corrective construction proposals to Architect for review before proceeding.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Pile excavation, placement, and testing.

2. Steel reinforcement welding.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Grout Tests: Testing of samples of fresh grout obtained according to ASTM C172/C172M shall be performed according to the following requirements:

1. Flow Rate: ASTM C939 and ASTM C109/C109M using a flow cone with 0.75-inch (19-mm) opening.

2. Compressive Strength: ASTM C109/C109M with cube specimens restrained from expansion according to ASTM C942.

a. Testing Frequency: Obtain six 2-inch (101-mm) cubes for each 50 cu. yd. (38 cu. m) or fraction thereof of grout placed, but not less than one set for each day's pour. Obtain an additional set of cubes from each truck during test pile placement.

b. Test two cubes at 7 days, two cubes at 28 days, and hold two cubes in reserve.

c. Strength of each grout mixture is satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

d. Report test results in writing to Architect, grout manufacturer, and Contractor within 48 hours of testing. List Project identification name and number, date of placement, name of testing and inspecting agency, location of grout batch in Work, design compressive strength at 28 days, grout mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests in reports of compressive-strength tests.

e. Additional Tests: Testing and inspecting agency to make additional tests of grout if test results indicate that compressive strengths or other requirements have not been met, as directed by Architect.

f. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.

g. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

D. Pile Inspection Reports: Prepare inspection reports for each auger cast grout pile as follows:

1. Pile location.
2. Pile diameter.
3. Actual top and bottom elevations.
4. Final top centerline location and deviations from requirements.
5. Variation from plumb.
6. Date and time of starting and completing.
7. Position and condition of reinforcing steel and splices or mechanical couplings.
8. Automatic monitoring equipment record including grout volume actually pumped.
9. Grout testing results.
10. Remarks, unusual conditions encountered, and deviations from requirements.

E. Certified Piles Survey: Prepared by a qualified land surveyor or professional engineer showing final location of piles in relation to the property survey and existing benchmarks.
   1. Notify Architect when deviations from locations exceed allowable tolerances.

F. Auger cast grout piles will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports.

3.6 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION

SECTION 32 1216

ASPHALT PAVING

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. Hot-mix asphalt paving.
2. Hot-mix asphalt overlay.
3. Cold milling of existing asphalt pavement.
4. Hot-mix asphalt patching.

B. Related Requirements:
1. 024119 "Selective Demolition" for demolition and removal of existing asphalt pavement.
2. Section 312000 "Earth Moving" for subgrade preparation, fill material, separation geotextiles, unbound-aggregate subbase and base courses, and aggregate pavement shoulders.
3. Section 321313 "Concrete Paving" for concrete pavement and for separate concrete curbs, gutters, and driveway aprons.
4. Section 321373 "Concrete Paving Joint Sealants" for joint sealants and fillers at pavement terminations.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
b. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.

1.4 ACTION SUBMITTALS

A. Product Data: Include technical data and tested physical and performance properties.
1. Herbicide.
2. Paving geotextile.
3. Joint sealant.

B. Hot-Mix Asphalt Designs:
1. Certification, by authorities having jurisdiction, of approval of each hot-mix asphalt design proposed for the Work.
2. For each hot-mix asphalt design proposed for the Work.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For paving-mix manufacturer and testing agency.

B. Material Certificates: Include statement that mixes containing recycled materials will perform equal to mixes produced from all new materials.
1. Aggregates.
2. Asphalt binder.
3. Asphalt cement.
4. Cutback prime coat.
5. Emulsified asphalt prime coat.
6. Tack coat.
7. Fog seal.

8. Undersealing asphalt.

C. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction (NCDOT).

B. Testing Agency Qualifications: Qualified in accordance with ASTM D3666 for testing indicated.

C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of NCDOT for asphalt paving work.
1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
1. Prime Coat: Minimum surface temperature of 60 deg F.
2. Tack Coat: Minimum surface temperature of 60 deg F.
3. Slurry Coat: Comply with weather limitations in ASTM D3910.
4. Asphalt Base Course and Binder Course: Minimum surface temperature of 40 deg F and rising at time of placement.
5. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: ASTM D692/D692M, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.

C. Fine Aggregate: ASTM D1073 or AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.
1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

D. Mineral Filler: ASTM D242/D242M or AASHTO M 17, rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

A. Asphalt Binder: ASTM D6373 or AASHTO M 320 binder designation PG 58-28, PG 64-22 or PG 70-22.

B. Asphalt Cement: ASTM D3381/D3381M for viscosity-graded material or ASTM D946/D946M for penetration-graded material.

C. Cutback Prime Coat: ASTM D2027/D2027M, medium-curing cutback asphalt, MC-30 or MC-70.

D. Emulsified Asphalt Prime Coat: ASTM D977 or AASHTO M 140 emulsified asphalt, or ASTM D2397/D2397M or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

E. Tack Coat: ASTM D977 or AASHTO M 140 emulsified asphalt, or ASTM D2397/D2397M or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

F. Water: Potable.

G. Undersealing Asphalt: ASTM D3141/D3141M; pumping consistency.

2.3 AUXILIARY MATERIALS

A. Recycled Materials for Hot-Mix Asphalt Mixes: Reclaimed asphalt pavement; reclaimed, unbound-aggregate base material; and recycled asphalt shingles from sources and gradations that have performed satisfactorily in previous installations, equal to performance of required hot-mix asphalt paving produced from all new materials.

B. Herbicide: Commercial chemical for weed control, registered by the EPA, and not classified as "restricted use" for locations and conditions of application. Provide in granular, liquid, or wettable powder form.

C. Sand: ASTM D1073 or AASHTO M 29, Grade No. 2 or No. 3.

D. Paving Geotextile: AASHTO M 288 paving fabric; nonwoven polypropylene; resistant to chemical attack, rot, and mildew; and specifically designed for paving applications.

E. Joint Sealant: ASTM D6690, Type II or III, hot-applied, single-component, polymer-modified bituminous sealant.

2.4 MIXES

A. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes approved by NCDOT and complying with the following requirements:
   1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
   2. Surface Course: SF9.5A or latest NCDOT requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protection: Provide protective materials, procedures, and worker training to prevent asphalt materials from spilling, coating, or building up on curbs, driveway aprons, manholes, and other surfaces adjacent to the Work.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
   1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
   2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
   3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

3.3 PATCHING

A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.
   1. Undersealing: Pump hot undersealing asphalt under rocking slab until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.
   2. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.

C. Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd..
   1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
   2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

D. Placing Single-Course Patch Material: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

E. Placing Two-Course Patch Material: Partially fill excavated pavements with hot-mix asphalt base course mix and, while still hot, compact. Cover asphalt base course with compacted layer of hot-mix asphalt surface course, finished flush with adjacent surfaces.

3.4 REPAIRS

A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.
   1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.

B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch.
   1. Clean cracks and joints in existing hot-mix asphalt pavement.
   2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.
   3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

3.5 SURFACE PREPARATION

A. Ensure that prepared subgrade has been proof-rolled and is ready to receive paving. Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces.

B. Herbicide Treatment: Apply herbicide in accordance with manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
   1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.

C. Cutback Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd.. Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.
   1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
   2. Protect primed substrate from damage until ready to receive paving.

D. Emulsified Asphalt Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.10 to 0.30 gal./sq. yd. per inch depth. Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.
   1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
   2. Protect primed substrate from damage until ready to receive paving.

E. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd..
   1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
   2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.6 HOT-MIX ASPHALT PLACEMENT

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
   1. Place hot-mix asphalt surface course in single lift.
   2. Spread mix at a minimum temperature of 250 deg F.
   3. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
   4. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
   1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches from strip to strip to ensure proper compaction of mix along longitudinal joints.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.7 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
   1. Clean contact surfaces and apply tack coat to joints.
   2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
   3. Offset transverse joints, in successive courses, a minimum of 24 inches.
   4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method in accordance with AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations.
   5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
   6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.8 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
   1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
   1. Average Density, Marshall Test Method: 96 percent of reference laboratory density in accordance with ASTM D6927 or AASHTO T 245, but not less than 94 percent or greater than 100 percent.
   2. Average Density, Rice Test Method: 92 percent of reference maximum theoretical density in accordance with ASTM D2041, but not less than 90 percent or greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.9 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce thickness indicated within the following tolerances:
   1. Surface Course: Plus 1/4 inch, no minus.

B. Pavement Surface Smoothness: Compact each course to produce surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
   1. Surface Course: 1/8 inch.
   2. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined in accordance with ASTM D3549.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement in accordance with ASTM D979 or AASHTO T 168.
   1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared in accordance with ASTM D2041, and compacted in accordance with job-mix specifications.
   2. In-place density of compacted pavement will be determined by testing core samples in accordance with ASTM D1188 or ASTM D2726.
      a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than three cores taken.
      b. Field density of in-place compacted pavement may also be determined by nuclear method in accordance with ASTM D2950 and coordinated with ASTM D1188 or ASTM D2726.

E. Replace and compact hot-mix asphalt where core tests were taken.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.11 WASTE HANDLING

A. General: Handle asphalt-paving waste in accordance with approved waste management plan required in Section 017419 "Construction Waste Management and Disposal."

END OF SECTION

SECTION 32 1313

CONCRETE PAVING

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 Concrete Paving Including the Following:
   1. Driveways.
   2. Roadways.
   3. Parking lots.
   4. Curbs and gutters.
   5. Walks.

B. Related Requirements:
   1. Section 033000 "Cast-in-Place Concrete for general building applications of concrete.
   2. Section 321373 "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.
   3. Section 321713 "Parking Bumpers."
   4. Section 321723 "Pavement Markings."

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review methods and procedures related to concrete paving, including but not limited to, the following:
      a. Concrete mixture design.
      b. Quality control of concrete materials and concrete paving construction practices.
   2. Require representatives of each entity directly concerned with concrete paving to attend, including the following:
      a. Contractor's superintendent.
      b. Independent testing agency responsible for concrete design mixtures.
      c. Ready-mix concrete manufacturer.
      d. Concrete paving Subcontractor.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color selection.

C. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified -mix concrete manufacturer and testing agency.

B. Material Certificates: For the following, from manufacturer:
   1. Cementitious materials.

2. Steel reinforcement and reinforcement accessories.
3. Admixtures.
4. Curing compounds.
5. Applied finish materials.
6. Bonding agent or epoxy adhesive.
7. Joint fillers.

C. Material Test Reports: For each of the following:
1. Aggregates: Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

D. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

B. Testing Agency Qualifications: Qualified according to ASTM C1077 and ASTM E329 for testing indicated.
1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified independent testing agency to perform preconstruction testing on concrete paving mixtures.

1.9 FIELD CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

C. Hot-Weather Concrete Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless otherwise indicated.

2.2 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.
   1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less. Do not use notched and bent forms.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

A. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, fabricated from steel wire into flat sheets.

B. Reinforcing Bars: ASTM A615/A615M, Grade 60; deformed.

C. Steel Bar Mats: ASTM A184/A184M; with ASTM A615/A615M, Grade 60 deformed bars; assembled with clips.

D. Plain-Steel Wire: ASTM A1064/A1064M,.

E. Joint Dowel Bars: ASTM A615/A615M, Grade 60 plain-steel bars. Cut bars true to length with ends square and free of burrs.

F. Tie Bars: ASTM A615/A615M, Grade 60; deformed.

G. Hook Bolts: ASTM A307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

H. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:
   1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
   2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

2.4 CONCRETE MATERIALS

A. Cementitious Materials: Use the following cementitious materials, of same type, brand, and source throughout Project:
   1. Portland Cement: ASTM C150/C150M, white portland cement Type I or Type II.
   2. Fly Ash: ASTM C618, Class F.
   3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
   4. Blended Hydraulic Cement: ASTM C595/C595M, Type IS, portland blast-furnace slag or Type IP, portland-pozzolan cement.

B. Normal-Weight Aggregates: ASTM C33/C33M, 1N uniformly graded. Provide aggregates from a single source[with documented service-record data of at least 10 years' satisfactory service in similar paving applications and service conditions using similar aggregates and cementitious materials.
   1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
   2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Air-Entraining Admixture: ASTM C260/C260M.

D. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
   1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
   2. Retarding Admixture: ASTM C494/C494M, Type B.

3. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

E. Water: Potable and complying with ASTM C94/C94M.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, dissipating.

E. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Anti-Hydro International, Inc.
2. ChemMasters, Inc.
3. Dayton Superior.
4. Euclid Chemical Company (The); an RPM company.
5. Kaufman Products, Inc.
6. Lambert Corporation.
7. Laticrete International, Inc.
8. Nox-Crete Products Group.
9. Unitex by Dayton Superior.

2.6 RELATED MATERIALS

A. Joint Fillers: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork in preformed strips.

B. Bonding Agent: ASTM C1059/C1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Epoxy-Bonding Adhesive: ASTM C881/C881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements, and of the following types:
1. Types I and II, nonload bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

D. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.
1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that comply with or exceed requirements.

E. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
1. Fly Ash or Pozzolan: 25 percent.
2. Slag Cement: 50 percent.
3. Combined Fly Ash or Pozzolan, and Slag Cement: 50 percent, with fly ash or pozzolan not exceeding 25 percent.

F. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

1. Air Content: 5 percent plus or minus 1-1/2 percent for 3/4-inch nominal maximum aggregate size.

G. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

H. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use [water-reducing admixture] [high-range, water-reducing admixture] [high-range, water-reducing and retarding admixture] [plasticizing and retarding admixture] in concrete as required for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

I. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than [1.0 lb/cu. yd.] [1.5 lb/cu. yd.] <Insert requirement>.

J. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

K. Concrete Mixtures: Normal-weight concrete.
1. Compressive Strength (28 Days): 3500 psi.
2. Maximum W/C Ratio at Point of Placement: 0.45.
3. Slump Limit: 5 inches, plus or minus 1 inch.

2.7 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M. Furnish batch certificates for each batch discharged and used in the Work.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.
1. For concrete batches of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For concrete batches larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.
1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Section 312000 "Earth Moving."

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded-wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
   1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
   1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
   2. Provide tie bars at sides of paving strips where indicated.
   3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
   4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
   5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
   1. Locate expansion joints at intervals of 50 feet unless otherwise indicated.
   2. Extend joint fillers full width and depth of joint.
   3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
   4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
   5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
   6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows, to match jointing of existing adjacent concrete paving:
   1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.
      a. Tolerance: Ensure that grooved joints are within 3 inches either way from centers of dowels.
   2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
      a. Tolerance: Ensure that sawed joints are within 3 inches either way from centers of dowels.
   3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.

B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
   1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels and joint devices.

H. Screed paving surface with a straightedge and strike off.

I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

J. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.

K. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.
   1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
   1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
   2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.
   3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3.8 SPECIAL FINISHES

3.9 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound or a combination of these as follows:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
   2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period, using cover material and waterproof tape.
   3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

3.10 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 and as follows:
   1. Elevation: 3/4 inch.
   2. Thickness: Plus 3/8 inch, minus 1/4 inch.
   3. Surface: Gap below 10-feet-long; unleveled straightedge not to exceed 1/2 inch.
   4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches of tie bar.
   5. Lateral Alignment and Spacing of Dowels: 1 inch.
   6. Vertical Alignment of Dowels: 1/4 inch.

7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches of dowel.
8. Joint Spacing: 3 inches.
9. Contraction Joint Depth: Plus 1/4 inch, no minus.
10. Joint Width: Plus 1/8 inch, no minus.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing and inspecting of composite samples of fresh concrete obtained according to ASTM C172/C172M shall be performed according to the following requirements:
1. Testing Frequency: Obtain at least one composite sample for each 2500 sq. ft. or fraction thereof of each concrete mixture placed each day.
a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C143/C143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C231/C231M, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C1064/C1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C31/C31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C39/C39M; test one specimen at seven days and two specimens at 28 days.
a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Concrete paving will be considered defective if it does not pass tests and inspections.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

I. Prepare test and inspection reports.

3.12 REPAIR AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

SECTION 32 1373

CONCRETE PAVING JOINT SEALANTS

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. Cold-applied joint sealants.
   2. Hot-applied joint sealants.
   3. Joint-sealant backer materials.
   4. Primers.

B. Related Requirements:
   1. Section 079200 "Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

C. Paving-Joint-Sealant Schedule: Include the following information:
   1. Joint-sealant application, joint location, and designation.
   2. Joint-sealant manufacturer and product name.
   3. Joint-sealant formulation.
   4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing agency.

B. Product Certificates: For each type of joint sealant and accessory.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Product Testing: Test joint sealants using a qualified testing agency.

1.7 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

2.2 COLD-APPLIED JOINT SEALANTS

A. Single-Component, Nonsag, Silicone Joint Sealant: ASTM D5893, Type NS.

B. Single-Component, Self-Leveling, Silicone Joint Sealant: ASTM D5893, Type SL.

C. Multicomponent, Nonsag, Urethane, Elastomeric Joint Sealant: ASTM C920, Type M, Grade NS, Class 25, for Use T.

D. Single Component, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C920, Type S, Grade P, Class 25, for Use T.

E. Multicomponent, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C920, Type M, Grade P, Class 25, for Use T.

2.3 HOT-APPLIED JOINT SEALANTS

A. Hot-Applied, Single-Component Joint Sealant: ASTM D6690, Type I.

B. Hot-Applied, Single-Component Joint Sealant: ASTM D6690, Type I or Type II.

C. Hot-Applied, Single-Component Joint Sealant: ASTM D6690, Type I, II, or III.

D. Hot-Applied, Single-Component Joint Sealant: ASTM D6690, Type IV.

2.4 JOINT-SEALANT BACKER MATERIALS

A. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.

B. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

C. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.

D. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.5 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

A. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions.

C. Install joint-sealant backings to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of joint-sealant backings.
   2. Do not stretch, twist, puncture, or tear joint-sealant backings.
   3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install joint sealants immediately following backing installation, using proven techniques that comply with the following:
   1. Place joint sealants so they fully contact joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:
   1. Remove excess joint sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.4 CLEANING AND PROTECTION

A. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.

B. Protect joint sealants, during and after curing period, from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

3.5 PAVING-JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Joints within concrete paving.
   1. Joint Location:
      a. Expansion and isolation joints in concrete paving.
      b. Contraction joints in concrete paving.
      c. Other joints as indicated.
   2. Joint Sealant: Single-component, nonsag, silicone joint sealant or Single-component, self-leveling, silicone joint sealant or Multicomponent, nonsag, urethane, elastomeric joint sealant or Single component, pourable, urethane, elastomeric joint sealant or Multicomponent, pourable, urethane, elastomeric joint sealant.
   3. Joint-Sealant Color: Provide Manufacturer's standard color chart for selection.

B. Joint-Sealant Application: Joints within concrete paving and between concrete and asphalt paving.
   1. Joint Location:
      a. Joints between concrete and asphalt paving.
      b. Joints between concrete curbs and asphalt paving.
      c. Other joints as indicated.
   2. Joint Sealant: Hot-applied, single-component joint sealant.
   3. Joint-Sealant Color: Provide Manufacturer's standard color chart for selection.

END OF SECTION

SECTION 32 1713

PARKING BUMPERS

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. Precast concrete wheel stops.

1.3 ACTION SUBMITTALS

A. Product Data:
   1. Precast concrete wheel stops.

PART 2 - PRODUCTS

2.1 PARKING BUMPERS

A. Precast Concrete Wheel Stops: Precast, steel-reinforced, air-entrained concrete; 4000-psi minimum compressive strength; manufacturer's standard height and width long. Provide chamfered corners, transverse drainage slots on underside, and a minimum of two factory-formed or -drilled vertical holes through wheel stop for anchoring to substrate.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. American Eagle Precast, LLC.
      b. American Precast Concrete Inc.
      c. Bush Concrete Products, Inc.
      d. Cast-Crete USA, Inc.
      e. Dura-Crete, Inc.
      f. Granite Precasting and Concrete, Inc.
      g. Oldcastle Precast, Inc.
      h. Steps Plus, Inc.
      i.
   2. Source Limitations: Obtain wheel stops from single source from single manufacturer.
   3. Surface Appearance: Smooth, free of pockets, sand streaks, honeycombs, and other obvious defects. Corners shall be uniform, straight, and sharp.
   4. Surface Sealer: Manufacturer's standard salt-resistant, clear sealer, applied at precasting location.
   5. Mounting Hardware: Galvanized-steel spike or dowel, 1/2-inch diameter, 14-inch minimum length.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that pavement is in suitable condition to begin installation in accordance with manufacturer's written instructions.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wheel stops in accordance with manufacturer's written instructions unless otherwise indicated.

B. Install wheel stops in bed of adhesive before anchoring to substrate.

C. Securely anchor wheel stops to substrate with hardware in each preformed vertical hole in wheel stop as recommended in writing by manufacturer. Recess head of hardware beneath top of wheel stop.

END OF SECTION

SECTION 32 1723

PAVEMENT MARKINGS

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. Painted markings applied to asphalt paving.
   2. Painted markings applied to concrete surfaces.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review methods and procedures related to marking asphalt paving or concrete surfaces including, but not limited to, the following:
      a. Asphalt-paving or concrete-surface aging period before application of pavement markings.
      b. Review requirements for protecting pavement markings, including restriction of traffic during installation period.

1.4 ACTION SUBMITTALS

A. Product Data: Include technical data and tested physical and performance properties.
   1. Pavement-marking paint, alkyd.
   2. Glass beads.

B. Shop Drawings:
   1. Indicate pavement markings, colors, lane separations, defined parking spaces, and dimensions to adjacent work.
   2. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

C. Samples: For each exposed product and for each color and texture specified; on rigid backing, 8 inches square.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of NCDOT for pavement-marking work with thermoplastic pint systems.
   1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for alkyd materials or 55 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Aexcel Inc.
   2. Colorado Paint Company; a subsidiary of Swarco Industries Inc.
   3. Columbia Paint & Coatings, Inc.; a subsidiary of Sherwin-Williams Company (The).
   4. Conco Paints.
   5. Diamond Vogel Paints.
   6. Dow Chemical Company (The).

7. Dunn-Edwards Corporation (a Nippon Paint Holdings Co. Ltd. company).
8. PPG Paints.
9. Sherwin-Williams Company (The).

B. Source Limitations: Obtain pavement-marking paints from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design.

2.3 PAVEMENT-MARKING PAINT

A. Pavement-Marking Paint, Alkyd: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248, Type N; colors complying with FS TT-P-1952F.
1. Color: As indicated.

B. Glass Beads: AASHTO M 247, Type 1 or FS TT-B-1325D, Type 1.
1. Roundness: Minimum 80 percent true spheres by weight.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that pavement-marking substrate is dry and in suitable condition to begin pavement marking in accordance with manufacturer's written instructions.

B. Proceed with pavement marking only after unsatisfactory conditions have been corrected.

3.2 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow asphalt paving or concrete surfaces to age for a minimum of 30 days before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to asphalt paving or concrete surface. Mask an extended area beyond edges of each stencil to prevent paint application beyond stencil. Apply paint so that it cannot run beneath stencil.
2. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal..

3.3 PROTECTING AND CLEANING

A. Protect pavement markings from damage and wear during remainder of construction period.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 32 3100
VERTICAL PIVOT VEHICLE GATE

SUMMARY

1.01 SECTION INCLUDES:

A. Vertically pivoting low voltage electrically operated vehicle access gate.
   1. Fully welded gate frame.
      a. Gate operator of a vertical pivot type, for opening and closing the gate.
      b. Security fence panels of chain link fabric
      c. Receiving yoke.
   2. Concrete and earthwork for operator and yoke pads.
   3. Push Button Gate Controls.
   4. Contact Edge and Photoelectric external secondary entrapment protection devices.

B. Products Not Furnished or Installed under This Section:
   1. Electrical power service to the gate operator.
   2. Line Fencing.
   3. Bollards and guardrails to protect operator.
   4. Security card access

1.02 RELATED SECTIONS

A. Section 32 3113 - Line fencing.

B. Section 03 3000 - Cast-In-Place Concrete.

C. Section 26 0500 - Basic Electrical Materials and Methods

1.03 PERFORMANCE REQUIREMENTS

A. Gate Dimensions Provide two gates, each having the following dimensions:
   1. Width - 20 feet. Height - Operator Pad surface to top of gate 7 feet.

B. Structural Performance: Engineer, fabricate, and install gate systems to withstand gate dead loads and wind live loads of 143 mph.

1.04 SUBMITTALS

A. Product Data: Submit sufficient manufacturer's data to indicate compliance with these specifications. Mark data to indicate:
   1. Details of material and construction.
   2. Recommended installation requirements to properly accommodate the proposed Gate and accessories.

B. Shop Drawings: Submit shop drawings for fabrication and installation of ornamental metal work. Include plans, elevations and detail sections. Indicate materials, methods, finishes and types of joinery, fasteners, anchorages and accessory items. Provide setting diagrams and templates for anchorages, sleeves, and bolts installed by others. Shop drawings to be field verified by installer.

1.05 REFERENCES

A. Comply with applicable (Federal/State/Local) code. Comply with requirements of Authorities Having Jurisdiction (AHJ) in Project location.
   1. Standards: Comply and adhere to current Operation Control Systems and Gate Panel Construction Standards.
      a. UL 325 - Standard for Safety for Door, Drapery, Gate, Louver, and Window Operators and Systems.
      b. CAN/CSA-C22.2 No. 247 Operators and Systems of Doors, Gates, Draperies, and Louvers
      c. ASTM F2200 - Standard Specification for Automated Vehicular Gate Construction.
   2. Electrical Components, Devices, and Accessories: NFPA 70, Article 100.

B. Chain link Fencing Standards:

1. Fencing and Gates: Chain Link Fence Manufacturer's Institute "Specifications for Fence-Posts, Gates and Accessories". Install in accordance with ASTM F567.

1.06 QUALITY ASSURANCE

A. Gate Operator Manufacturer Qualifications: Minimum three (3) years documented experience producing systems specified in this section. Furnish UL 325 Listing Certification for Gate Operator specified in this section.

B. Gate Panel Fabricator Qualifications: Minimum three (3) years documented experience in automated gate panel fabrication. Furnish detailed drawing of gate panel that is in compliance with ASTM F2200.

C. Installer Qualifications: An experienced installer who has completed fences and gates similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance as well as compliance with 1.5 A. 1. previously outlined.

1.07 DELIVERY, STORAGE AND HANDLING

A. Store components to avoid damage from moisture, abrasion, and other construction activities. Carefully store materials off the ground to provide proper protection against oxidation caused by ground contact.

1.08 PROJECT CONDITIONS

A. Field Measurements and Verification: Installer shall measure, verify and generate dimensions where Gate and Operator are to be located. Indicate specific location of gate with regard to existing roadways, proposed roadways, curb locations grade changes and elevations. Indicate specific location of Gate Operator and its respective concrete foundation; include surrounding landscaping, fencing, buildings and other fixed stationary objects near the gate operator and gate panel in both open and closed positions.

1.09 COORDINATION AND SEQUENCING

A. Coordinate gate installation with line fencing and paving. Gate and Operator can be installed independent of paving providing the Operator concrete foundation is in place, including electrical control conduits. Upon completion of installation place the Gate in an open position and maintain vertically clear of traffic and surrounding fence line installation.

B. Operators are designed for 120 volt 15 amp primary service and 24 Volt DC battery back-up (recommended two (2) Group 24, 12V, Deep Cycle, 100 Amp Hour batteries to be field supplied and installed). Installer is to coordinate electrical service with electrical design and electrical trades. Service connection is supplied via underground conduit and recommended to include a GFCI circuit breaker (subject to code or project specifications). Connection is made into a 4” x 4” handy box inside the Operator. Within the box wire GFCI Duplex Receptacle “HOT” off of the main breaker. Receptacle may be used for loads under 15 Amps such as hand tools and the like.

1.10 WARRANTY

A. Standard Warranty: Provide manufacturer's standard three (3) year warranty against defective materials and workmanship after Date of Substantial Completion. Any materials, parts, components, or attachments not manufactured by AutoGate are covered by the applicable manufacturers warranty.

B. Two Year Extended Warranty: Provide a two year extended manufacturer's warranty for the entire warranty period covering defective materials and workmanship for the following additional extended period beyond the standard three year warranty.

1.11 PRODUCTS

1.12 ACCEPTABLE MANUFACTURER

A. Acceptable Products: AutoGate, Inc. Berlin Heights, Ohio VPG Vertical Pivot Gate System.
   1. Style 300 - Chainlink mesh and diagonal bracing.

1.13 GATE CONSTRUCTION

A. Materials:
   1. Aluminum Assembly Framing:
      a. Plate, Shapes and Bar: ASTM B221, alloy 6061-T6 or 6063-T6.
      b. Extrusions: Alloy and temper 6063-T6 except formed elbows shall be 6063-T4:
      c. Round Aluminum Pipe: Standard weight extruded structural aluminum pipe, alloy 6063-T6, mill finish, complying with ASTM B429.
      d. Provide lock washer or other locking device at all bolted connections.
      e. 2. Steel Assembly Framing:
         1) High strength steel pipe triple coated in accordance with ASTM F1043 Group IC; SS40 as manufactured by Allied Tube & Conduit.
            (a) External coatings per ASTM F1043 Type B; internal coatings per ASTM F1043 Type D.
            (b) Post welding treatments: All welded joints to be coated ZRC or equivalent zinc rich coating.
         2) Steel Tubes: ASTM A500 Cold-Formed Welded Pipe and Structural Tubing Hot-Dipped, Zinc-Coated.
            (a) External coating weldable Epoxy powder coat primer (Epoxy Z Kote by Atlas Tubing).
         3) Steel Shapes plates and bars: ASTM A36.
      f. 3. Threaded Fasteners:
         1) a. All exterior screws, bolts, nut and washers shall be 300 Series non-magnetic
         2) stainless steel.
         3) b. Provide lock washers or other locking devices such as deformed thread lock or
         4) nylon locking nuts at all bolted connections.

B. Fabrication:
   1. Fabricate perimeter frames of gates from steel tubing. Assemble gate frames by welding at corners. Infill gate frames with panels to match adjacent fence panels.
   2. Configuration: Size and space members in compliance with applicable codes. All gate framing members shall be unspliced single pipe or tube length.
   3. Bracing:
      a. Provide diagonal welded pipe gate trusses to prevent sag.
      b. Masted Wind Bracing: Required for gates over 20’ or more in length or more than 7’ in height, and/or code requirement beyond 75 mph winds.
         1) Provide continuous tube elements which attach to the operator and extend a minimum of 2/3 the length of the gate. Wind bracing is also secured to the bottom of the gate with strut plates.
   4. Fully assemble gate leaves in the manufacturer‘s shop with no joints splices or bolted sections. Open tube ends or sections are not acceptable.
   5. Welding: Make exposed joints butt tight, flush, and hairline. Continuously seal joined members by continuous welds.

C. Fabricated frame and infill fabrics: Epoxy coating, PVC Coating, or unpainted mill finish fabrics to match fence line color.

D. Provide components required for receiving yoke anchorage of gate ends. Fabricate anchors and related components of material and finish matching gate frame.

1.14 GATE OPERATORS

A. Provide gate operator system, including gate operator, field supplied manufacturer specified batteries, external entrapment contact sensing equipment and external entrapment non-contact sensing equipment.
   1. Gate Speed: Fully open to fully closed and fully closed to open not less than 10-12 seconds.

2. Frequency of Use: Continuous duty.
3. Battery Powered Back Up DC Drive System: Operator to run on 24 Volt DC current stand-by battery system with built-in battery maintainer "over-charge" protection.
    a. Field supplied: Provide two (2) Group 24, 12v batteries, complying with gate operator manufacturer's requirements (Deep Cycle 100 Amp Hour).
    b. Power supply to operator: 120VAC (15 amp) .
4. Gate Operator Enclosure: Fabricate operator enclosure from steel tubing and sheet metal. Continuous seal weld all frames seams with welds ground smooth. Screwed frames are not acceptable.
    a. Frame: 2" Sq., 11 Ga. (.120) Steel Tubing
    b. Skins: 18 Ga. Galvanneal Sheet
    c. Mounting Pads: 3" wide x 3/8" thick 304 Stainless Steel flat bar.
    d. Finish: Operator skins are powder coated for Black systems. Gate panels and optional operator skins are finished with Diamond Vogel water based spray application. Color, Grey.
5. Mechanical Gate Operator Drive: 24 VDC 1/3 HP high torque gear motor and DBL reduction DBL "V" belt design.
6. Control Circuitry: Solid state coated control board in NEMA 4x weatherproof electrical enclosure. Sealed proximity switches ensure weather and moisture-proof integrity. (Boards tested to –40º F).
    a. Control Wiring: 16 & 18 Ga. single conductor. Copper w/electrolytic copper compression terminals tin-plated for maximum corrosion prevention.

B. Gate Operator System shall be Listed to UL 325 Class II and the gate panel shall be fabricated in accordance with ASTM F2200.
1. Type A Entrapment Sensing Device - Operator shall have inherent motor current sensors as part of the gate operator system. Type A shall be constructed such that it may not be removed or bypassed.
2. Operator shall have provision for connection of Control System and for connection of [or supplied with] Secondary Entrapment Sensing Device specified hereinafter.

C. Secondary Entrapment Sensing Device: Provide the following external secondary entrapment protection devices as appropriate for the specific site conditions to protect against all potential entrapment zones. All entrapment areas/zones must be identified by the installer and have physical restrictions of pedestrian access such as fence sections preventing reach through or standing in the entrapment zone or the installer shall supply additional secondary entrapment protection devices to protect pedestrians in all entrapment areas.
1. Photo Beams Type B1 - Non-contact sensor (photoelectric sensor or the equivalent); Acceptable Products:
    a. EMX Industries Model#: IRB-325 Transmitter / receiver type
    b. Allen Bradley Model#: 60-2728 Retro-reflective type
    c. Omron / MMTC Model#: E3K-R10K4-NR Retro-reflective type
2. Safety Edges (Contact Edges) Type B2 - Contact sensor (edge device or the equivalent) Acceptable Product:
    a. Miller Edge Model ME-120

D. Operator Options:
1. Provide surge and spike protection (Recommended by AutoGate – Shall be Field Supplied per governing code compliance, owner acceptance, or project specifications).
2. Provide Audible/Audible-Visual Warning Device(s) activated when gate is in motion.
3. Provide External Emergency Stop Button (Twist resettable or Key Resettable) (Mounted on the operator cabinet/near the operator/etc.)

1.15 CONTROL SYSTEMS

A. Operation control system: Remote-control stations, safety devices, and weatherproof enclosures; coordinate electrical requirements with building electrical system.

1. Control Station (located remotely from gate): Momentary-contact [Two Position (Open/close)] [Three position (Open, stop, close)]. Provide key switch to lock out open and close buttons.

B. Provide emergency stop button in an outdoor weather tight enclosure.

1.16 ACCESSORIES

A. Provide audible and visible warning device to signal both directions when the gate is opening and closing. (ADA compliant)

B. Provide UL 325 compliant warning signs on each side of gate. Installer to ensure signs are visible on both sides of the gate in both the open and closed position.

C. Provide retro-reflective tape on gate frame (MUTCD, FHWA, etc. compliant)

D. Provide Gate Panel mounted, rigid conduit secured flashing lights (visible in single/both directions of travel, mounted on top of gate/mounted mid-section horizontally)

1.17 SETTING MATERIAL

A. Ready-mixed concrete complying with ASTM C94: Normal-weight concrete [air entrained] 3000-psi 28 days compressive strength, 3-inch slump, and aggregate.
   1. Portland cement: ASTM C150, Type I.
   2. Aggregates: ASTM C33, 1-inch maximum size.

B. Reinforcing Bars: ASTM A615 or governing code/project specification.

C. Service and control conduit: Rigid Schedule 40 PVC embedded in concrete. All other conduit and wiring as specified in Division [26] [16].

D. Expansion Bolts: Threaded or wedge type; galvanize ferrous castings, ASTM A47 malleable iron or ASTM A27 cast steel

1.18 EXECUTION

1.19 EXAMINATION

A. Installer's Examination: Examine conditions under which construction activities of this section are to be performed and insure all specified criteria is adhered to.

B. Submit written notification to Architect and system manufacturer if such conditions are unacceptable.

C. Beginning installation constitutes installer's acceptance of conditions.

1.20 ELECTRICAL SERVICE & CONTROLS

A. Provide all power and control wiring required for the work in accordance with the applicable provisions of Division [26] [16] and NEC 70.

B. Perform all trenching and backfilling associated with this Section. Conduit shall be direct buried except under areas of vehicular traffic where it shall be reinforced concrete encased.

C. Grounding system: All equipment and branch circuits shall be grounded. Provide driven ground rod at service. Provide separate ground wire in all branch circuits.

1.21 PADS & RECEIVING YOKES

A. Foundations: Construct pads and yoke bases as indicated on the drawings with top of concrete flat and level.

B. Excavation:
   1. Locate concrete foundations for operator base on firm, undisturbed soil.
   2. Yoke Excavation: Drill or hand-excavate holes.

C. Vibrate or tamp concrete for consolidation. Finish top of foundations, smooth and even. Cure concrete 72 hours before place operator.

D. Fasteners: Install operators and receiving yoke plates with expansion bolts provided by the Gate system manufacturer.

1.22 OPERATOR INSTALLATION

A. Install units in accordance with the manufacturer's instructions.
   1. Operator Expansion Bolt Mounting: Anchor through operator footpad holes to concrete substrate.
   2. Install all loose shipped operator lower panels and guarding per manufacturer instructions.

B. Secondary Entrapment Sensing Device: Installing contractor shall be responsible for providing, installing, and testing all external secondary entrapment protection devices as appropriate for the specific site conditions to protect against all potential entrapment zones. Proper operation of these safety devices shall be verified and training as to the operation and maintenance of these devices for the users and owners shall be documented.

1.23 GATE INSTALLATION

A. Connect frame and operator in accordance with gate manufacturer’s instruction.

B. Install gate so that it is plumb and level when fully closed within the following tolerances:
   1. Maximum misalignment from true position: 1/4 inch (6.0 mm).
   2. Maximum misalignment between adjacent separated members: 1/8 inch (3.0 mm).

1.24 ADJUSTING

A. Adjust and lubricate operating components for smooth, accurate operation free of binding and racking.

1.25 START-UP AND DEMONSTRATION

A. Manufacturer's Service Representative: Provide at least 2 hours of manufacturer's representatives time for start-up and initial operation. Make a final check of each gate operation, with Owner's personnel present, immediately before date of substantial completion.

B. Instruct Owner's personnel in proper use, operations, and daily maintenance of gate. Review emergency provisions, including procedures to be followed if gate does not close or open.

C. Train Owner's personnel in normal procedures to be followed in checking for sources of damage to wind bracing, operational failures or malfunctions.

D. Full Wind Rating and Derating: Full wind load rating is subject to the wind bracing remaining in excellent condition and not compromised. Periodic inspection is a must in order to maintain full wind load rating. Any dents, bends, nicks and loose bolts will affect the performance of the bracing must be corrected or repaired. Additional, non-factory supplied signage must be approved by manufacturer.

E. Determine that control systems and operating devices are functioning properly.

F. [Adjust time clock for periods required and as directed.]

1.26 CLEANING AND PROTECTION

A. Remove dust or other foreign matter from component surfaces; clean finishes in accordance with manufacturer's instructions.
   1. Clean units in accordance with the manufacturer's instructions.

B. Protection: After installation, protect installed work until project completion.
   1. Ensure that finishes and structure of installed systems are not damaged by subsequent construction activities.
   2. If minor damage to finishes occurs, repair damage in accordance with manufacturer's recommendations; provide replacement components if repaired finishes are unacceptable to Architect.

END OF SECTION

SECTION 32 3119
DECORATIVE METAL FENCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Decorative aluminum fences.

B. Automatic gate operators.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

B. Section 31 2316 - Excavation.

1.03 REFERENCE STANDARDS

A. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2017.

B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

C. ASTM F2408 - Standard Specification for Ornamental Fences Employing Galvanized Steel Tubular Pickets; 2016.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to start of work of this section; require attendance by affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings:
   1. Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.

D. Manufacturer's Installation Instructions: Indicate installation requirements, post foundation anchor bolt templates, and _____.

E. Manufacturer's Qualification Statement.

F. Installer's Qualification Statement.

G. Project Record Documents: Accurately record actual locations of property perimeter posts relative to property lines _____.

H. Manufacturer's Warranty.

1.06 QUALITY ASSURANCE

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

B. Installer Qualifications: Experienced with type of construction involved and materials and techniques specified and approved by fence manufacturer.

1.07 DELIVERY, STORAGE AND HANDLING

A. Store materials in a manner to ensure proper ventilation and drainage. Protect against damage, weather, vandalism and theft.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty for _____.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Decorative Metal Fences and Gates:
   1. Alumi-Guard; _____: www.alumi-guard.com/#sle.
   2. Ameristar Perimeter Security, USA; _____: www.ameristarfence.com/#sle.
   3. Ideal Aluminum Products; _____: www.ideal-ap.com/#sle.
   4. Superior Aluminum Products, Inc; _____: www.superioraluminum.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

B. Automatic Gate Operators:
   1. Tymetal Corp; _____: www.tymetal.com/#sle.

C. Decorative Metal Fences and Gate Hardware:
   1. D&D Technologies USA, Inc; LokkLatch, Model _____: www.ddtechglobal.com/#sle.

2.02 FENCES

A. Fences: Complete factory-fabricated system of posts and panels, accessories, fittings, and fasteners; finished with electrodeposition coating, and having the following performance characteristics:
   1. Capable of resisting vertical load, horizontal load and infill performance requirements for fence categories defined in ASTM F2408.

B. Aluminum: ASTM B221.
   1. Tubular Pickets, Rails and Posts: 6005-T5 alloy.
   2. Extrusions for Posts and Rails (Outer Channel): 6005-T5 alloy.
   3. Extrusions for Pickets and Rail (Inner Slide Channels): 6063-T5 alloy.

C. Fasteners: ASTM A276/A276M, Type 302 stainless steel; finished to match fence components.

2.03 ALUMINUM FENCE

A. Decorative Aluminum Fence System: Provide fence meeting the Test Load and Coating Performance requirements of ASTM F2408 for Industrial class.
   1. Fence Panels: 5 feet high by 6 feet long.
      a. Panel Style: Three rail.
      b. Panel Strength: Capable of supporting 270 pounds minimum load applied at midspan without deflection.
      c. Attach panels to posts with manufacturer's standard panel brackets and recommended fasteners.
      d. Posts: Aluminum extrusions; 2-1/2 inches square.
      e. Rails: Extruded aluminum channels.
         1) Enclosed Retaining Rod: 1/8 inch diameter galvanized steel with variable pitch connection system for high angle racking and elimination of external fasteners.
         2) Picket Spacing, Standard: 3-7/8 inch on center.
      f. Pickets: Extruded aluminum tubes.
         1) Size: 1 inch square.
         2) Style: Pickets with finial extend above top rail.
      g. Fasteners: Manufacturer's standard stainless steel bolts, screws, and washers; factory finish fasteners to match fence.
      h. Accessories: Aluminum castings, extrusions and cold-formed strips; factory finished to match fence.
         1) Triad spear point finial.
      i. Flexibility: Capable of following variable slope of up to 1:4.
      j. Color: As selected by Architect from manufacturer's standard range.
      k. Products:
         1) Alumi-Guard, Ornamental Picket Fences; Premier: www.alumi-guard.com/#sle.
         2) Ameristar Perimeter Security, USA; Echelon II: www.ameristarfence.com/#sle.

3) Substitutions: See Section 01 6000 - Product Requirements & SUBSTITUTIONS.

B. Decorative Aluminum Post-and-Rail Fence and Swinging Gates:
   1. Style: Three-rail.
   2. Posts: Aluminum extrusions; _____ inch square.
   3. Color: As selected by Architect from manufacturer's standard range.

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.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Set fence posts in accordance with the manufacturer recommended spacing.

C. Space gate posts according to the manufacturers' drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected.
   1. Base type and quantity of gate hinges on the application; weight, height, and number of gate cycles.
   2. Identify the necessary hardware required for the application on the manufacturer's gate drawings.
   3. Provide gate hardware by the manufacturer of the gate and install in compliance with manufacturer's recommendations.

END OF SECTION

SECTION 334100

STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Pipe and fittings.
   2. Nonpressure transition couplings.
   3. Pressure pipe couplings.
   4. Cleanouts.
   5. Drains.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of cast-iron soil pipe and fitting, from manufacturer.

B. Field quality-control reports.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
   1. Notify Architect no fewer than three days in advance of proposed interruption of service.
   2. Do not proceed with interruption of service without Architect's written permission.

PART 2 - PRODUCTS

2.1 PE PIPE AND FITTINGS

A. Corrugated PE Drainage Pipe and Fittings NPS 3 to NPS 10: AASHTO M 252M, Type S, with smooth waterway for coupling joints.
   1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings.
   2. Soiltight Couplings: AASHTO M 252M, corrugated, matching tube and fittings.

B. Corrugated PE Pipe and Fittings NPS 12 to NPS 60: AASHTO M 294M, Type S, with smooth waterway for coupling joints.
   1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.
   2. Soiltight Couplings: AASHTO M 294M, corrugated, matching pipe and fittings.

2.2 NONPRESSURE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:
   1. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.

2. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

2.3 CLEANOUTS

A. Cast-Iron Cleanouts:
   1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
   2. Top-Loading Classification(s): Heavy Duty.
   3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

B. Plastic Cleanouts:
   1. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.4 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350/350R, and the following:
   1. Cement: ASTM C 150, Type II.
   2. Fine Aggregate: ASTM C 33, sand.
   3. Coarse Aggregate: ASTM C 33, crushed gravel.
   4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.
   1. Reinforcing Fabric: ASTM A 185, steel, welded wire fabric, plain.
   2. Reinforcing Bars: ASTM A 615, Grade 60 deformed steel.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Install gravity-flow, nonpressure drainage piping according to the following:
   1. Install piping pitched down in direction of flow.
   2. Install PE corrugated sewer piping according to ASTM D 2321.

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping according to the following:
   1. Join corrugated PE piping according to ASTM D 3212 for push-on joints.
   2. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.4 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
   1. Use Heavy-Duty, top-loading classification cleanouts.

B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches < deep. Set with tops 1 inch above surrounding earth grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.5 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.6 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Section 221413 "Facility Storm Drainage Piping."

B. Make connections to existing piping and underground manholes.
   1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
   2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
   3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.
      a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
      b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
   4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

C. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
   1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.

3.7 IDENTIFICATION

A. Materials and their installation are specified in Section 312000 "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
   1. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.8 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
   1. Submit separate reports for each system inspection.

2. Defects requiring correction include the following:
    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping.
3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
    a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.9 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with water.

END OF SECTION