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

STUMP SOUND ELEMENTARY SCHOOL
NEW SCHOOL

ONSLOW COUNTY SCHOOLS

HOLLY RIDGE, NORTH CAROLINA

VOLUME 1

P I N N A C L E A R C H I T E C T U R E , P . A .

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for
Stump Sound Elementary School –New School
Holly Ridge, North Carolina

DIVISION 00

SECTION 00 11 13: ADVERTISEMENT FOR BIDS

Stump Sound Elementary School – New School
Holly Ridge, North Carolina

Sealed proposals will be received by the Architect on behalf of the **Onslow County Board of Education in Meeting Room #4, 200 Broadhurst Road, Jacksonville, NC on Tuesday, September 17, 2019. All bids will be publicly opened and read for the construction at 3:00 p.m. on this date.** Bids will be received for a Single Prime Contract for the construction as shown and noted in the contract documents. All Contractors are hereby notified that they shall be properly licensed under the State Laws of North Carolina governing their trades. All Contractors will be required to submit a Statement of Qualifications (AIA Document A305 or equivalent) twenty-four (24) hours before requesting Bid Documents.

Proposal must be on standard forms furnished by the Architect and must be addressed as follows:

Bid: **Stump Sound Elementary School - New School**
Attn: Mr. Steve Myers, Chief of Operations
C/O Pinnacle Architecture
200 Broadhurst Road
Jacksonville, NC 28540

Proposal forms, plans and specifications may be obtained from the office of the Architect, **Pinnacle Architecture, P.A., PO Box 187, (630 Team Rd. Ste 200), Matthews, NC 28106 (28105) (704)847-9851 or email stacey@pinnaclearchitecture.net.** A deposit will be required for each set of plans and specifications (Limit 4) along with shipping account information or prepaid shipping label, prior to plans and specifications being sent out. Deposits for plans and specifications will be $200.00 for each set. The full deposit is refundable to contractors submitting a Bona Fide bid and returning the plans and specifications in satisfactory condition within ten (10) days of the bid date. All subcontractors and suppliers will be required to purchase plans and specifications. Individual sheets or partial sections of specifications will not be issued.

A **Pre-Bid Conference** will be conducted in the **Onslow County Board of Education Meeting Room #4**, located at **200 Broadhurst Road, Jacksonville, NC 28540 at 2:00 p.m. on Wednesday, September 4, 2019.**

A brief summary of the project scope:

The Project consists of the construction of a new elementary school, approximately one hundred nine thousand (109,000) square feet. The school will house an administration wing, classroom wings, gymnasium, media center and cafeteria with a full-service kitchen. The building will be conditioned by a combination of split system air conditioning and vertical exterior heat pump; electrical service will be 277/480V & 120/208v with an emergency (NG powered) generator. The building will be fully sprinklered. This project includes Alternates of additional classrooms, Owner preferred items and a diesel-powered generator (see Section 01 23 00).

Each proposal must be accompanied by a deposit of cash or a certified check on a bank or trust company insured by the Federal Deposit Insurance Corporation in an amount equal to not less than five percent (5%) of the proposal; or, in lieu of the deposit of cash or certified check, a bid bond in the above amount. Successful bidder may not withdraw his bid within thirty days after the opening thereof without forfeiture of his bid bond. In the event of the 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, the above deposit will be retained by the Owner as liquidated damages.

The Owner reserves the right to accept or reject any and/or all bids, to waive informalities, and to award the contract to other than the low bidder should it be deemed in the best interest of the project or the Owner.

Onslow County Schools
Mr. Steve Myers
Chief of Operations

DIVISION 00

SECTION 00 11 13.1: ADVERTISEMENT FOR BIDS - COMBINATION BID

Stump Sound Elementary School – New School
Holly Ridge, North Carolina
Catherine Lake Elementary School – New School
Jacksonville, North Carolina

Sealed proposals will be received by the Architect on behalf of the **Onslow County Board of Education in Meeting Room #4, 200 Broadhurst Road, Jacksonville, NC on Tuesday, September 17, 2019. All bids for both schools combined will be publicly opened and read for the construction at 2:00 p.m. on this date.** Bids will be received for a Single Prime Contract for the construction as shown and noted in the contract documents. All Contractors are hereby notified that they shall be properly licensed under the State Laws of North Carolina governing their trades. All Contractors will be required to submit a Statement of Qualifications (AIA Document A305 or equivalent) twenty-four (24) hours before requesting Bid Documents.

Proposal must be on standard forms furnished by the Architect and must be addressed as follows:

Bid: **Stump Sound ES/Catherine Lake ES - New Schools**
Attn: Mr. Steve Myers, Chief of Operations
C/O Pinnacle Architecture
200 Broadhurst Road
Jacksonville, NC 28540

Proposal forms, plans and specifications may be obtained from the office of the Architect, **Pinnacle Architecture, P.A., PO Box 187, (630 Team Rd. Ste 200), Matthews, NC 28106 (28105) (704)847-9851 or email stacey@pinnaclearchitecture.net.** A deposit will be required for each set of plans and specifications (Limit 4) along with shipping account information or prepaid shipping label, prior to plans and specifications being sent out. Deposits for plans and specifications will be $200.00 for each set. The full deposit is refundable to contractors submitting a Bona Fide bid and returning the plans and specifications in satisfactory condition within ten (10) days of the bid date. All subcontractors and suppliers will be required to purchase plans and specifications. Individual sheets or partial sections of specifications will not be issued.

A **Pre-Bid Conference** will be conducted in the **Onslow County Board of Education Meeting Room #4**, located at **200 Broadhurst Road, Jacksonville, NC 28540 at 2:00 p.m. on Wednesday, September 4, 2019.**

A brief summary of the project scope:

The Project consists of the construction of two (2) new elementary schools, to be constructed in different locations (refer to plans) and approximately one hundred nine thousand (109,000) square feet each. The schools will each house an administration wing, classroom wings, gymnasium, media center and cafeteria with a full-service kitchen. The buildings will be conditioned by a combination of split system air conditioning and vertical exterior heat pump; electrical service will be 277/480V & 120/208v with an emergency (NG powered) generator. The buildings will be fully sprinklered. This project includes Alternates of additional classrooms, Owner preferred items and a diesel-powered generator at each school (see Section 01 23 00).

Each proposal must be accompanied by a deposit of cash or a certified check on a bank or trust company insured by the Federal Deposit Insurance Corporation in an amount equal to not less than five percent (5%) of the proposal; or, in lieu of the deposit of cash or certified check, a bid bond in the above amount. Successful bidder may not withdraw his bid within thirty days after the opening thereof without forfeiture of his bid bond. In the event of the 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, the above deposit will be retained by the Owner as liquidated damages.

The Owner reserves the right to accept or reject any and/or all bids, to waive informalities, and to award the contract to other than the low bidder should it be deemed in the best interest of the project or the Owner.

Onslow County Schools
Mr. Steve Myers
Chief of Operations

DIVISION 00

SECTION 00 21 13: INSTRUCTIONS FOR BIDDERS

Stump Sound Elementary School –New School
Holly Ridge, North Carolina

1. This job will be bid as a **Single Prime** Contract project. Each Contractor will be required to submit his bid on the provided forms. One copy of each Proposal Form is included herein. Each bidder must submit one copy of the Proposal Form properly filled out and signed. A copy of the Proposal Form should be retained for the Contractor's files.

2. One set of Contract Documents will be made available at each of the following locations:

   Architect's Office: Pinnacle Architecture, P.A.
   630 Team Road, Suite 200 (P.O. Box 187)
   Matthews, North Carolina 28105 (28106)
   Phone: 704/847-9851 FAX: 704/847-9853

   Documents will also be available online at the following plan room websites:

   ConstructConnect™ Plan Room
   Dodge Plan Room

3. Qualifications of Bidder Offices: The Owner may make such investigations as he deems necessary to determine the ability of the bidder to perform the work. The bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder fails to satisfy the Owner that such bidder is properly qualified to carry out the obligations of the contract and to complete the work contemplated therein. Conditional bids will not be accepted.

4. **Bidders are required to visit the site**, compare drawings and specifications with any work in place, and inform themselves of all conditions, including other work if any, being performed. Failure to visit site will in no way relieve successful bidder from necessity of furnishing any materials or performing any work that may be required to complete work in accordance with intent of drawings and specifications without additional cost to Owner. Inaccurate details or conditions of existing conditions indicated on the plans should be brought to the attention of the Architect prior to bid letting. The submission of a bid shall be taken as prima facie evidence of compliance with this section.

5. Requests for individual sheets of drawings or sections of specifications from suppliers and/or sub-bidders will not be honored. Suppliers and/or Sub-bidders will be required to visit designated plan rooms, Architect's office or prime contractor's office to review bidding information. The Architect will not be responsible for any misinformation, misinterpretation, misunderstanding and/or bidding mistakes made by any suppliers and/or sub-bidders requesting individual sheets of drawings and/or sections of specifications to bid the project. All prime contractors, their sub-contractors and suppliers are responsible for all work indicated, described and intended in these complete construction documents, to include all specifications, addenda and plans. Bidders shall notify Architect of any discrepancies before submitting his/her bid.

6. Interpretations: No interpretation of the plans, specifications or other pre-bid documents will be made to any bidder orally. Every request for interpretation of the drawings, specifications, or other pre-bid documents should be in writing and **faxed to Pinnacle Architecture, P.A., at 704/847-9853 or requests can be emailed to randy@pinnaclearchitecture.net, melissa@pinnaclearchitecture.net and stacey@pinnaclearchitecture.net,** and to be given consideration must be received at least ten (10) days prior to the date fixed for the opening of bids. Any and all interpretations and supplemental instructions will be in the form of written addenda to the specifications which, if issued, will be mailed, faxed or emailed with return receipt requested to all prospective bidders, at the addresses furnished for such purposes, not later than seven (7) days prior to the date fixed for opening of bids. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under his bid as submitted. Any addenda issued during the time of bidding shall become part of the contract documents. (Also refer to Item 21 - this section).

7. It is hereby understood and mutually agreed by and between the Successful Bidder and Owner, that the date of beginning and the time for completion as specified in the contract of the work to be done hereunder are ESSENTIAL CONDITIONS of this contract. It is intended that the work under this contract shall be started immediately after the signing of the contract and that the work shall be completed, and ready for occupancy by the Owner on or before the date stipulated in the Contractor's Proposal and incorporated in the Construction Contract.

8. Any bidder may modify his bid by telegraphic communication at any time prior to the scheduled closing time for receipt of bids, provided such telegraphic communication is received by the Owner prior to the closing time, and, provided further, the Owner is satisfied that a written confirmation of the telegraphic modification over the signature of the bidder was mailed prior to the closing time. The telegraphic communication should not reveal the bid price but should provide the addition or subtraction or other modification so that the final prices or terms will not be known by the Owner until the sealed bid is opened. If written confirmation is not received within two days from the closing time, no consideration will be given to the telegraphic modification.

9. Bid Security: Each bid must be accompanied by cash, certified check of the bidder, or a Bid Bond prepared on the form of Bid Bond, attached thereto, duly executed by the bidder as principal and having as surety thereon a surety company approved by the Owner, in the amount of 5% of the bid. Such cash, checks or Bid Bonds will be returned to all except the three lowest bidders within three days after the opening of bids, and the remaining cash, checks, or Bid Bonds will be returned promptly after the Owner and the accepted bidder have executed the contract, or, if no award has been made within 30 days after the date of the opening of bids, upon demand of the bidder at any time thereafter, so long as he has not been notified of the acceptance of his bid.

10. The successful bidder must furnish a performance bond for the work covering the full contract price and a material payment bond to guarantee payment of all obligations arising under the contract.

11. Attorneys-in-fact who sign Bid Bonds or Contract Bonds must file with each Bond a certified and effectively dated copy of their Power of Attorney.

12. Withdrawing of Bid(s): The Owner may consider informal any bid not prepared and submitted in accordance with the provisions herein and may waive any informalities or

reject any and all bids. Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered. No bidder may withdraw a bid within 30 days after the actual date of the opening thereof.

13. Laws and Regulations: The bidder's attention is directed to the fact that all applicable State laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout, and they will be deemed to be included in the contract the same as though herein written out in full.

14. Bidders will understand that work herein described shall be completed in every detail, notwithstanding every item necessarily involved is not particularly mentioned. Successful Bidder will be held to provide labor and material necessary for entire completion of work intended to be described, and shall not avail himself of any manifestly unintentional error or omission, should same exist. Should any error or inconsistency appear, or occur in drawings or specifications, before proceeding with work contractor shall make mention of same to Architect for proper interpretation; in no case shall he proceed with work in uncertainty.

15. Taxes: The Bidders attention is called to the fact that governing State and local tax laws including sales tax that apply to material entering into the construction covered in these drawings and specifications will be the responsibility of the Contractor.

16. The term Contractor as used in these specifications will be interpreted to mean any prime contractor. Prime Contractor is any contractor employed on the project that by law is employed under or that has for any reason a separate contract with the Owner.

17. Should drawings disagree in themselves or with specifications the better quality or greater quantity of work or material shall be furnished, unless otherwise ordered in writing. Specifications and drawings enumerated are intended to be cooperative, and what is called for in either shall go as binding as if called for in both.

18. Preference shall be given to calculated dimensions on drawings rather than measurements by scale. Bidders shall verify all dimensions given on drawings, and shall report any error or inconsistency to the Architect for correct interpretation and/or dimension.

19. Names of a certain brand, make, or manufacturer where used in these specifications are intended to set forth and convey to prospective bidders the general style, type, character, and quality of the article desired, and is not intended to restrict bidders to the specified brand, make or manufacturer named.

20. When three or more brand names are specified without the "or equal" qualification, Bidders shall base their proposal price on any one of the listed brands; no other brand will be considered.

21. When prior approval is required or substitutions are allowed by the "or equal" qualification and therefore so indicated in the specifications such approval must be obtained from the Architect ten (10) days prior to the date set for the opening of bids. To insure timely consideration of substitutions, the person or firm requesting approval shall submit a cut-sheet, sample or other data representative of the product specified to allow the Architect to determine if, indeed the substitution is acceptable. Architect's approval will be issued in the form of an addendum not later than three (3) days prior to the date set for the opening

of bids and listing all approved substitutions. No substitutions will be allowed other than those listed in the addendum(s). (Also refer to Item 6, Interpretation(s), this section and Section 00 91 13).

22. Contractor(s) shall take field measurements and verify field conditions and shall carefully compare such field conditions and measurements and other information known to the contractor with the written and drawn portion of the Contract Documents before commencing activity. Errors in consistencies and/or omissions discovered shall be reported to the Architect at once for interpretation/clarification.

23. The Architect of record is the interpreter of the Contract Documents.

AIA® Document A701™ – 1997

Instructions to Bidders

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

THE OWNER:
(Name, legal status and address)

THE ARCHITECT:
(Name, legal status and address)

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

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

TABLE OF ARTICLES

ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Advertisement or Invitation to Bid, Instructions to Bidders, Supplementary Instructions to Bidders, the bid form, and other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications and all Addenda issued prior to execution of the Contract.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, AIA Document A201, or in other Contract Documents are applicable to the Bidding Documents.

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

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

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

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

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

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

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

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 The Bidder by making a Bid represents that:

§ 2.1.1 The Bidder has read and understands the Bidding Documents or Contract Documents, to the extent that such documentation relates to the Work for which the Bid is submitted, and for other portions of the Project, if any, being bid concurrently or presently under construction.

§ 2.1.2 The Bid is made in compliance with the Bidding Documents.

§ 2.1.3 The Bidder has visited the site, become familiar with local conditions under which the Work is to be performed and has correlated the Bidder's personal observations with the requirements of the proposed Contract Documents.

§ 2.1.4 The Bid is based upon the materials, equipment and systems required by the Bidding Documents without exception.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 COPIES

§ 3.1.1 Bidders may obtain complete sets of the Bidding Documents from the issuing office designated in the Advertisement or Invitation to Bid in the number and for the deposit sum, if any, stated therein. The deposit will be refunded to Bidders who submit a bona fide Bid and return the Bidding Documents in good condition within ten days after receipt of Bids. The cost of replacement of missing or damaged documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the Bidding Documents and the Bidder's deposit will be refunded.

§ 3.1.2 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the Advertisement or Invitation to Bid, or in supplementary instructions to bidders.

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

§ 3.1.4 The Owner and Architect may make copies of the Bidding Documents available on the above terms for the purpose of obtaining Bids on the Work. No license or grant of use is conferred by issuance of copies of the Bidding Documents.

§ 3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

§ 3.2.1 The Bidder shall carefully study and compare the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is submitted, shall examine the site and local conditions, and shall at once report to the Architect errors, inconsistencies or ambiguities discovered.

§ 3.2.2 Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request which shall reach the Architect at least seven days prior to the date for receipt of Bids.

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

§ 3.3 SUBSTITUTIONS

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

§ 3.3.2 No substitution will be considered prior to receipt of Bids unless written request for approval has been received by the Architect at least ten days prior to the date for receipt of Bids. Such requests shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for an evaluation. A statement setting forth changes in other materials, equipment or other portions of the Work, including changes in the work of other contracts that incorporation of the proposed substitution would require, shall be included. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

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

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

§ 3.4 ADDENDA

§ 3.4.1 Addenda will be transmitted to all who are known by the issuing office to have received a complete set of Bidding Documents.

§ 3.4.2 Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.

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

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

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 PREPARATION OF BIDS

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

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

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

§ 4.1.4 Interlineations, alterations and erasures must be initialed by the signer of the Bid.

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

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall make no additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name of the Bidder and the nature of legal form of the Bidder. The Bidder shall provide evidence of legal authority to perform within the jurisdiction of the Work. Each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder.

§ 4.2 BID SECURITY

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

§ 4.2.2 If a surety bond is required, it shall be written on AIA Document A310, Bid Bond, unless otherwise provided in the Bidding Documents, and the attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of the power of attorney.

§ 4.2.3 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until either (a) the Contract has been executed and bonds, if required, have been furnished, or (b) the specified time has elapsed so that Bids may be withdrawn or (c) all Bids have been rejected.

§ 4.3 SUBMISSION OF BIDS

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

§ 4.3.2 Bids shall be deposited at the designated location prior to the time and date for receipt of Bids. Bids received after the time and date for receipt of Bids will be returned unopened.

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

§ 4.3.4 Oral, telephonic, telegraphic, facsimile or other electronically transmitted bids will not be considered.

§ 4.4 MODIFICATION OR WITHDRAWAL OF BID

§ 4.4.1 A Bid may not be modified, withdrawn or canceled by the Bidder during the stipulated time period following the time and date designated for the receipt of Bids, and each Bidder so agrees in submitting a Bid.

§ 4.4.2 Prior to the time and date designated for receipt of Bids, a Bid submitted may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the

signature of the Bidder. Written confirmation over the signature of the Bidder shall be received, and date- and time-stamped by the receiving party on or before the date and time set for receipt of Bids. A change shall be so worded as not to reveal the amount of the original Bid.

§ 4.4.3 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids provided that they are then fully in conformance with these Instructions to Bidders.

§ 4.4.4 Bid security, if required, shall be in an amount sufficient for the Bid as resubmitted.

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 OPENING OF BIDS

At the discretion of the Owner, if stipulated in the Advertisement or Invitation to Bid, the properly identified Bids received on time will be publicly opened and will be read aloud. An abstract of the Bids may be made available to Bidders.

§ 5.2 REJECTION OF BIDS

The Owner shall have the right to reject any or all Bids. A Bid not accompanied by a required bid security or by other data required by the Bidding Documents, or a Bid which is in any way incomplete or irregular is subject to rejection.

§ 5.3 ACCEPTANCE OF BID (AWARD)

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest qualified Bidder provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. The Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's own best interests.

§ 5.3.2 The Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the low Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 CONTRACTOR'S QUALIFICATION STATEMENT

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request, a properly executed AIA Document A305, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted as a prerequisite to the issuance of Bidding Documents.

§ 6.2 OWNER'S FINANCIAL CAPABILITY

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

§ 6.3 SUBMITTALS

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

.1 a designation of the Work to be performed with the Bidder's own forces;

.2 names of the manufacturers, products, and the suppliers of principal items or systems of materials and equipment proposed for the Work; and

.3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

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

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder in writing if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, (1)

withdraw the Bid or (2) submit an acceptable substitute person or entity with an adjustment in the Base Bid or Alternate Bid to cover the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

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

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 BOND REQUIREMENTS

§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Bonds may be secured through the Bidder's usual sources.

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

§ 7.1.3 If the Owner requires that bonds be secured from other than the Bidder's usual sources, changes in cost will be adjusted as provided in the Contract Documents.

§ 7.2 TIME OF DELIVERY AND FORM OF BONDS

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

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond. Both bonds shall be written in the amount of the Contract Sum.

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

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

ARTICLE 8 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

Unless otherwise required in the Bidding Documents, the Agreement for the Work will be written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment Is a Stipulated Sum.

DIVISION 00

SECTION 00 41 13: GENERAL CONSTRUCTION PROPOSAL (SINGLE PRIME)

Stump Sound Elementary School –New School
Folkstone Road
Holly Ridge, North Carolina 28445

Gentlemen:

The undersigned, as bidder, hereby declares that the only person or persons, interested in this proposal as principal is/or are named herein and that no other person than herein named 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 of fraud.

Having examined the contract plans, specifications and other documents, visited the site and being familiar with all requirements of same, I (or we) propose to furnish all the materials and perform all the work necessary for the General Construction of the above referenced project in strict accordance with the plans, specifications and other contract documents prepared by Pinnacle Architecture, P.A., Matthews, North Carolina for the sum of:

_____Dollars

($_____). The time required for construction will be _____ calendar days.

A certified check in the amount of $_____ (5%), or a Bid Bond in the amount of 5% of the Bid, or a cash deposit in the amount of $_____ (5%) is attached hereto.

We also agree that after the presentation of this proposal, that a reasonable time, and in no case less than 30 days, will be allowed **Onslow County Schools** for the necessary approvals before awarding the contract.

The undersigned further agrees that, in case of failure on his part to execute the said contract and the bond within ten (10) consecutive days after written notice being given of the award of the contract, the check or bid bond accompanying this bid and the monies payable thereon, shall be paid to **Onslow County Schools**, as liquidated damages for such failure; otherwise, the check or bid bond accompanying this proposal shall be returned to the undersigned.

ALTERNATES

Alternate #1 (Six (6) Classroom Addition)	Add: $_____
	Deduct: $_____
Alternate #2 (Owner Preferred Finish Hardware)	Add: $_____
	Deduct: $_____
Alternate #3 (Owner Preferred Equipment) (1) Fire Alarm - Notifier	Add: $_____
	Deduct: $_____
Alternate #3 (Owner Preferred Equipment) (2) Gear/Panels/Disconnects…-Square D	Add: $_____
	Deduct: $_____
Alternate #4 (Generator, Diesel)	Add: $_____
	Deduct: $_____

UNIT PRICES

Ceramic/Porcelain Tile Installed	$_____per square foot
Quarry Tile Installed	$_____per square foot
Suspended Acoustical Ceiling Installed	$_____per square foot
Resilient Flooring (VCT) Installed	$_____per square foot
Resilient Sports Flooring Installed	$_____per square foot
Epoxy Terrazzo Installed	$_____per square foot
Carpet/Carpet Tile Installed	$_____per square foot
Paint Installed	$_____per square foot
Dirt Excavation	$_____per cubic yard
Compacted Fill	$_____per cubic yard
Unsuitable Soil (disposed of Off-site)	$_____per cubic yard
Off-site Borrow Fill (engineered, compacted in place)	$_____per cubic yard
Rock Excavation, Mass Rock	$_____per cubic yard
Rock Excavation, Trench Rock	$_____per cubic yard

Formed Cast in Place Reinforced Concrete $_____per cubic yard

Heavy-Duty Asphalt Paving $_____per square foot

Light-Duty Asphalt Paving $_____per square foot

SUBCONTRACTORS LIST

GENERAL:_____ Amount $_____

PLUMBING:_____ Amount $_____

HVAC:_____ Amount $_____

ELECTRICAL:_____ Amount $_____

SITE WORK:_____ Amount $_____

Contractor's State License No. _____

Contractor _____

By _____

NOTE: BID PROPOSAL FORM MUST BE COMPLETELY FILLED OUT (i.e. BASE BID PRICE, TIME IN CALENDAR DAYS, LICENSE NO. AND SIGNATURE) TO BE READ. ANY ALTERNATE OR UNIT PRICE LEFT BLANK WILL BE CONSIDERED "NO ADDITIONAL CHARGE" ($0.00). UNIT PRICES WILL NOT BE READ PUBLICLY, BUT WILL BE A PART OF THE CONTRACT.

Acknowledge of Receipt of Addenda

Addendum No._____ Signature_____ Date_____

Addendum No._____ Signature_____ Date_____

Addendum No._____ Signature_____ Date_____

Addendum No._____ Signature_____ Date_____

Addendum No._____ Signature_____ Date_____

DIVISION 00

SECTION 00 41 13.1: GENERAL CONSTRUCTION PROPOSAL (COMBINED FOR BOTH SCHOOLS)

Catherine Lake Elementary School –New School
4821 Richlands Highway
Jacksonville, North Carolina 28540

&

Stump Sound Elementary School –New School
Folkstone Road
Holly Ridge, North Carolina 28445

Gentlemen:

The undersigned, as bidder, hereby declares that the only person or persons, interested in this proposal as principal is/or are named herein and that no other person than herein named 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 of fraud.

Having examined the contract plans, specifications and other documents, visited the site and being familiar with all requirements of same, I (or we) propose to furnish all the materials and perform all the work necessary for the General Construction of the above referenced project in strict accordance with the plans, specifications and other contract documents prepared by Pinnacle Architecture, P.A., Matthews, North Carolina for the sum of:

_____Dollars

($_____). The time required for construction will

be _____ calendar days.

A certified check in the amount of $_____ (5%), or a Bid Bond in the amount of 5% of the Bid, or a cash deposit in the amount of $_____ (5%) is attached hereto.

We also agree that after the presentation of this proposal, that a reasonable time, and in no case less than 30 days, will be allowed **Onslow County Schools** for the necessary approvals before awarding the contract.

The undersigned further agrees that, in case of failure on his part to execute the said contract and the bond within ten (10) consecutive days after written notice being given of the award of the contract, the check or bid bond accompanying this bid and the monies payable thereon, shall be paid to **Onslow County Schools**, as liquidated damages for such failure; otherwise, the check or bid bond accompanying this proposal shall be returned to the undersigned.

ALTERNATES FOR CATHERINE LAKE ELEMENTARY SCHOOL

Alternate #1 - Six (6) Classroom Addition	Add: $_____
	Deduct: $_____
Alternate #2 - Owner Preferred Finish Hardware	Add: $_____
	Deduct: $_____
Alternate #3 - Owner Preferred Equipment (1) Fire Alarm - Notifier	Add: $_____
	Deduct: $_____
Alternate #3 - Owner Preferred Equipment (2) Gear/Panels/Disconnects…-Square D	Add: $_____
	Deduct: $_____
Alternate #4 - Generator	Add: $_____
	Deduct: $_____

UNIT PRICES

Ceramic/Porcelain Tile Installed	$_____per square foot
Quarry Tile Installed	$_____per square foot
Suspended Acoustical Ceiling Installed	$_____per square foot
Resilient Flooring (VCT) Installed	$_____per square foot
Resilient Sports Flooring Installed	$_____per square foot
Epoxy Terrazzo Installed	$_____per square foot
Carpet/Carpet Tile Installed	$_____per square foot
Paint Installed	$_____per square foot
Dirt Excavation	$_____per cubic yard
Compacted Fill	$_____per cubic yard
Unsuitable Soil (disposed of Off-site)	$_____per cubic yard
Off-site Borrow Fill (engineered, compacted in place)	$_____per cubic yard
Rock Excavation, Mass Rock	$_____per cubic yard
Rock Excavation, Trench Rock	$_____per cubic yard

Formed Cast in Place Reinforced Concrete	$_____per cubic yard
Heavy-Duty Asphalt Paving	$_____per square foot
Light-Duty Asphalt Paving	$_____per square foot

SUBCONTRACTORS LIST

GENERAL:_____ Amount $_____

PLUMBING:_____ Amount $_____

HVAC:_____ Amount $_____

ELECTRICAL:_____ Amount $_____

SITE WORK:_____ Amount $_____

ALTERNATES FOR STUMP SOUND ELEMENTARY SCHOOL

Alternate #1 - Six (6) Classroom Addition	Add: $_____
	Deduct: $_____
Alternate #2 - Owner Preferred Finish Hardware	Add: $_____
	Deduct: $_____
Alternate #3 - Owner Preferred Equipment (1) Fire Alarm - Notifier	Add: $_____
	Deduct: $_____
Alternate #3 - Owner Preferred Equipment (2) Gear/Panels/Disconnects…-Square D	Add: $_____
	Deduct: $_____
Alternate #4 - Generator	Add: $_____
	Deduct: $_____

UNIT PRICES

Ceramic/Porcelain Tile Installed	$_____per square foot
Quarry Tile Installed	$_____per square foot
Suspended Acoustical Ceiling Installed	$_____per square foot
Resilient Flooring (VCT) Installed	$_____per square foot
Resilient Sports Flooring Installed	$_____per square foot
Epoxy Terrazzo Installed	$_____per square foot
Carpet/Carpet Tile Installed	$_____per square foot
Paint Installed	$_____per square foot
Dirt Excavation	$_____per cubic yard
Compacted Fill	$_____per cubic yard
Unsuitable Soil (disposed of Off-site)	$_____per cubic yard
Off-site Borrow Fill (engineered, compacted in place)	$_____per cubic yard
Rock Excavation, Mass Rock	$_____per cubic yard
Rock Excavation, Trench Rock	$_____per cubic yard

Formed Cast in Place Reinforced Concrete $_____per cubic yard

Heavy-Duty Asphalt Paving $_____per square foot

Light-Duty Asphalt Paving $_____per square foot

SUBCONTRACTORS LIST

GENERAL:_____ Amount $_____

PLUMBING:_____ Amount $_____

HVAC:_____ Amount $_____

ELECTRICAL:_____ Amount $_____

SITE WORK:_____ Amount $_____

Contractor's State License No. _____

Contractor _____

By _____

NOTE: BID PROPOSAL FORM MUST BE COMPLETELY FILLED OUT (i.e. BASE BID PRICE, TIME IN CALENDAR DAYS, LICENSE NO. AND SIGNATURE) TO BE READ. ANY ALTERNATE OR UNIT PRICE LEFT BLANK WILL BE CONSIDERED "NO ADDITIONAL CHARGE" ($0.00). UNIT PRICES WILL NOT BE READ PUBLICLY, BUT WILL BE A PART OF THE CONTRACT.

Acknowledge of Receipt of Addenda

Addendum No._____ Signature_____ Date_____

Addendum No._____ Signature_____ Date_____

Addendum No._____ Signature_____ Date_____

Addendum No._____ Signature_____ Date_____

Addendum No._____ Signature_____ Date_____

State of North Carolina --AFFIDAVIT B-- Intent to Perform Contract with Own Workforce.

County of _____

Affidavit of _____
(Name of Bidder)

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

_____ contract.
(Name of Project)

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

The Bidder agrees to provide any additional information or documentation requested by the owner in support of the above statement. The Bidder agrees to make a Good Faith Effort to utilize minority suppliers where possible.

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 _____

State of North Carolina AFFIDAVIT A – Listing of Good Faith Efforts

County of _____

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

The undersigned, if apparent low bidder, will enter into a formal agreement with the firms listed in the Identification of Minority Business Participation schedule conditional upon scope of contract to be executed with the Owner. Substitution of contractors must be in accordance with GS143-128.2(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 _____

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

State of North Carolina - AFFIDAVIT C - Portion of the Work to be Performed by HUB Certified/Minority Businesses

County of _____

(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 HUB certified/minority businesses as defined in GS143-128.2(g) and 128.4(a),(b),(e) is equal to or greater than 10% 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 **72 hours** after notification of being low bidder.

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

_____
(Project Name)

Project ID#_____ Amount of Bid $_____

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

Name and Phone Number	*Minority Category	**HUB Certified Y/N	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**)

**** HUB Certification with the state HUB Office required to be counted toward state participation goals.**

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

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

Date:_____ Name of Authorized Officer:_____

SEAL

Signature:_____

Title:_____

State of _____, County of _____
Subscribed and sworn to before me this _____day of _____20____
Notary Public_____
My commission expires_____

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

State of North Carolina AFFIDAVIT D – Good Faith Efforts

County of _____

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

If the goal of 10% participation by HUB Certified/ minority business **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)

Project ID#_____ Amount of Bid $_____

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

Name and Phone Number	*Minority Category	**HUB Certified Y/N	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**)

**** HUB Certification with the state HUB Office required to be counted toward state participation goals.**

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

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

Date:_____ Name of Authorized Officer:_____

Signature:_____

Title:_____

SEAL

State of _____, County of _____

Subscribed and sworn to before me this _____day of _____20____

Notary Public_____

My commission expires _____

AIA® Document A101™ – 2017

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

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

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

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

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

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

The Owner and Contractor agree as follows.

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

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

The parties should complete A101™–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement.

AIA Document A201™–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

TABLE OF ARTICLES

ARTICLE 1 THE CONTRACT DOCUMENTS

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

ARTICLE 2 THE WORK OF THIS CONTRACT

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

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[ ] The date of this Agreement.

[ ] A date set forth in a notice to proceed issued by the Owner.

[ ] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

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

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

§ 3.3 Substantial Completion

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

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

[ ] By the following date:

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

Portion of Work	Substantial Completion Date

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

ARTICLE 4 CONTRACT SUM

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

§ 4.2 Alternates

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

Item	Price

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

Item	Price	Conditions for Acceptance

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

Item	Price

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

Item	Units and Limitations	Price per Unit ($0.00)

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

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

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

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

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

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

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

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

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

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

.1 That portion of the Contract Sum properly allocable to completed Work;

.2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and

.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

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

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

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

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

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

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

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

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

§ 5.2 Final Payment

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

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment has been issued by the Architect.

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

§ 5.3 Interest

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

%

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

§ 6.2 Binding Dispute Resolution

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

[ ] Arbitration pursuant to Section 15.4 of AIA Document A201–2017

[ ] Litigation in a court of competent jurisdiction

[ ] Other *(Specify)*

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

ARTICLE 7 TERMINATION OR SUSPENSION

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

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

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

ARTICLE 8 MISCELLANEOUS PROVISIONS

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

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

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

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

§ 8.5 Insurance and Bonds

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

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

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

§ 8.7 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction

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

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

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

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

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

[ ] The Sustainability Plan:

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

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

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

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

AIA® Document A101™ – 2017 Exhibit A

Insurance and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the day of in the year
(In words, indicate day, month and year.)

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

THE OWNER:
(Name, legal status and address)

THE CONTRACTOR:
(Name, legal status and address)

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

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

This document is intended to be used in conjunction with AIA Document A201™–2017, General Conditions of the Contract for Construction. Article 11 of A201™–2017 contains additional insurance provisions.

TABLE OF ARTICLES

ARTICLE A.1 GENERAL

The Owner and Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term General Conditions refers to AIA Document A201™–2017, General Conditions of the Contract for Construction.

ARTICLE A.2 OWNER'S INSURANCE

§ A.2.1 General

Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Article A.2 and, upon the Contractor's request, provide a copy of the property insurance policy or policies required by Section A.2.3. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

§ A.2.2 Liability Insurance

The Owner shall be responsible for purchasing and maintaining the Owner's usual general liability insurance.

§ A.2.3 Required Property Insurance

§ A.2.3.1 Unless this obligation is placed on the Contractor pursuant to Section A.3.3.2.1, the Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.

§ A.2.3.1.1 Causes of Loss. The insurance required by this Section A.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire, explosion, theft, vandalism, malicious mischief, collapse, earthquake, flood, or windstorm. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, design, specifications, workmanship, or materials. Sub-limits, if any, are as follows:
(Indicate below the cause of loss and any applicable sub-limit.)

Causes of Loss	Sub-Limit

§ A.2.3.1.2 Specific Required Coverages. The insurance required by this Section A.2.3.1 shall provide coverage for loss or damage to falsework and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and reasonable compensation for the Architect's and Contractor's services and expenses required as a result of such insured loss, including claim preparation expenses. Sub-limits, if any, are as follows:
(Indicate below type of coverage and any applicable sub-limit for specific required coverages.)

Coverage	Sub-Limit

§ A.2.3.1.3 Unless the parties agree otherwise, upon Substantial Completion, the Owner shall continue the insurance required by Section A.2.3.1 or, if necessary, replace the insurance policy required under Section A.2.3.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 12.2.2 of the General Conditions.

§ A.2.3.1.4 Deductibles and Self-Insured Retentions. If the insurance required by this Section A.2.3 is subject to deductibles or self-insured retentions, the Owner shall be responsible for all loss not covered because of such deductibles or retentions.

§ A.2.3.2 Occupancy or Use Prior to Substantial Completion. The Owner's occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.2.3.1 have consented in writing to the continuance of coverage. The Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

§ A.2.3.3 Insurance for Existing Structures
If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, "all-risks" property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage from the causes of loss identified in Section A.2.3.1, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties.

§ A.2.4 Optional Extended Property Insurance.
The Owner shall purchase and maintain the insurance selected and described below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. For each type of insurance selected, indicate applicable limits of coverage or other conditions in the fill point below the selected item.)

[ ] **§ A.2.4.1 Loss of Use, Business Interruption, and Delay in Completion Insurance**, to reimburse the Owner for loss of use of the Owner's property, or the inability to conduct normal operations due to a covered cause of loss.

[ ] **§ A.2.4.2 Ordinance or Law Insurance**, for the reasonable and necessary costs to satisfy the minimum requirements of the enforcement of any law or ordinance regulating the demolition, construction, repair, replacement or use of the Project.

[ ] **§ A.2.4.3 Expediting Cost Insurance**, for the reasonable and necessary costs for the temporary repair of damage to insured property, and to expedite the permanent repair or replacement of the damaged property.

[ ] **§ A.2.4.4 Extra Expense Insurance**, to provide reimbursement of the reasonable and necessary excess costs incurred during the period of restoration or repair of the damaged property that are over and above the total costs that would normally have been incurred during the same period of time had no loss or damage occurred.

[ ] **§ A.2.4.5 Civil Authority Insurance**, for losses or costs arising from an order of a civil authority prohibiting access to the Project, provided such order is the direct result of physical damage covered under the required property insurance.

[ ] **§ A.2.4.6 Ingress/Egress Insurance**, for loss due to the necessary interruption of the insured's business due to physical prevention of ingress to, or egress from, the Project as a direct result of physical damage.

[ ] **§ A.2.4.7 Soft Costs Insurance**, to reimburse the Owner for costs due to the delay of completion of the Work, arising out of physical loss or damage covered by the required property insurance: including construction loan fees; leasing and marketing expenses; additional fees, including those of architects, engineers, consultants, attorneys and accountants, needed for the completion of the construction, repairs, or reconstruction; and carrying costs such as property taxes, building permits, additional interest on loans, realty taxes, and insurance premiums over and above normal expenses.

§ A.2.5 Other Optional Insurance.

The Owner shall purchase and maintain the insurance selected below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance.)

[ ] **§ A.2.5.1 Cyber Security Insurance** for loss to the Owner due to data security and privacy breach, including costs of investigating a potential or actual breach of confidential or private information.

(Indicate applicable limits of coverage or other conditions in the fill point below.)

[ ] **§ A.2.5.2 Other Insurance**
(List below any other insurance coverage to be provided by the Owner and any applicable limits.)

Coverage	Limits

ARTICLE A.3 CONTRACTOR'S INSURANCE AND BONDS

§ A.3.1 General

§ A.3.1.1 Certificates of Insurance. The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section A.3.2.1 and Section A.3.3.1. The certificates will show the Owner as an additional insured on the Contractor's Commercial General Liability and excess or umbrella liability policy or policies.

§ A.3.1.2 Deductibles and Self-Insured Retentions. The Contractor shall disclose to the Owner any deductible or self-insured retentions applicable to any insurance required to be provided by the Contractor.

§ A.3.1.3 Additional Insured Obligations. To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage to include (1) the Owner, the Architect, and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, CG 20 32 07 04.

§ A.3.2 Contractor's Required Insurance Coverage

§ A.3.2.1 The Contractor shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain insurance for a duration other than the expiration of the period for correction of Work, state the duration.)

§ A.3.2.2 Commercial General Liability

§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than ($) each occurrence, ($) general aggregate, and ($) aggregate for products-completed operations hazard, providing coverage for claims including

.1 damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;
.2 personal injury and advertising injury;
.3 damages because of physical damage to or destruction of tangible property, including the loss of use of such property;
.4 bodily injury or property damage arising out of completed operations; and
.5 the Contractor's indemnity obligations under Section 3.18 of the General Conditions.

§ A.3.2.2.2 The Contractor's Commercial General Liability policy under this Section A.3.2.2 shall not contain an exclusion or restriction of coverage for the following:

.1 Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.

.2 Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.

.3 Claims for bodily injury other than to employees of the insured.

.4 Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured.

.5 Claims or loss excluded under a prior work endorsement or other similar exclusionary language.

.6 Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.

.7 Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.

.8 Claims related to roofing, if the Work involves roofing.

.9 Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.

.10 Claims related to earth subsidence or movement, where the Work involves such hazards.

.11 Claims related to explosion, collapse and underground hazards, where the Work involves such hazards.

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than ($) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

§ A.3.2.4 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ A.3.2.5 Workers' Compensation at statutory limits.

§ A.3.2.6 Employers' Liability with policy limits not less than ($) each accident, ($) each employee, and ($) policy limit.

§ A.3.2.7 Jones Act, and the Longshore & Harbor Workers' Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and docks

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than ($) per claim and ($) in the aggregate.

§ A.3.2.9 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than ($) per claim and ($) in the aggregate.

§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than ($) per claim and ($) in the aggregate.

§ A.3.2.11 Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than ($) per claim and ($) in the aggregate.

§ A.3.2.12 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than ($) per claim and ($) in the aggregate.

§ A.3.3 Contractor's Other Insurance Coverage

§ A.3.3.1 Insurance selected and described in this Section A.3.3 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain any of the types of insurance selected below for a duration other than the expiration of the period for correction of Work, state the duration.)

§ A.3.3.2 The Contractor shall purchase and maintain the following types and limits of insurance in accordance with Section A.3.3.1.
(Select the types of insurance the Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)

[ ] **§ A.3.3.2.1** Property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3. The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below:
(Where the Contractor's obligation to provide property insurance differs from the Owner's obligations as described under Section A.2.3, indicate such differences in the space below. Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)

[ ] **§ A.3.3.2.2 Railroad Protective Liability Insurance**, with policy limits of not less than ($) per claim and ($) in the aggregate, for Work within fifty (50) feet of railroad property.

[ ] **§ A.3.3.2.3 Asbestos Abatement Liability Insurance**, with policy limits of not less than ($) per claim and ($) in the aggregate, for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos-containing materials.

[ ] **§ A.3.3.2.4** Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.

[ ] **§ A.3.3.2.5** Property insurance on an "all-risks" completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.

[ ] **§ A.3.3.2.6 Other Insurance**
(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage	Limits

§ A.3.4 Performance Bond and Payment Bond

The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, as follows:
(Specify type and penal sum of bonds.)

Type	Penal Sum ($0.00)
Payment Bond	
Performance Bond	

Payment and Performance Bonds shall be AIA Document A312™, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312™, current as of the date of this Agreement.

ARTICLE A.4 SPECIAL TERMS AND CONDITIONS

Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:

Identification of HUB Certified/ Minority Business Participation

I,_____
(Name of Bidder)
do hereby certify that on this project, we will use the following HUB Certified/ minority business as construction subcontractors, vendors, suppliers or providers of professional services.

Firm Name, Address and Phone #	Work Type	*Minority Category	**HUB Certified (Y/N)

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

**** HUB Certification with the state HUB Office required to be counted toward state participation goals.**

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

STATE OF NORTH CAROLINA
COUNTY SALES AND USE TAX REPORT
SUMMARY TOTALS AND CERTIFICATION

CONTRACTOR: _____ Page __1____ of _____

PROJECT: _____ FOR PERIOD: _____

	TOTAL FOR COUNTY OF:	TOTAL FOR COUNTY OF:	TOTAL FOR COUNTY OF:	TOTAL FOR COUNTY OF:	TOTAL FOR COUNTY OF:	TOTAL FOR COUNTY OF:	TOTAL ALL COUNTIES
CONTRACTOR							
SUBCONTRACTOR(S)*							
COUNTY TOTAL							

* Attach subcontractor(s) report(s)
** Must balance with Detail Sheet(s)

I certify that the above figures do not include any tax paid on supplies, tools and equipment which were used to perform this contract and only includes those building materials, supplies, fixtures and equipment which actually became a part of or annexed to the building or structure. I certify that, to the best of my knowledge, the information provided here is true, correct, and complete.

Sworn to and subscribed before me,

This the _____ day of _____, 20____

_____
Signed

_____
Notary Public

_____
Print or Type Name of Above

My Commission Expires: _____

Seal

NOTE:
This certified statement may be subject to audit.

STATE OF NORTH CAROLINA
SALES AND USE TAX REPORT DETAIL

CONTRACTOR: _____

SUBCONTRACTOR _____ FOR PERIOD: _____

PROJECT: _____

PURCHASE DATE	VENDOR NAME	INVOICE NUMBER	TYPE OF PROPERTY	INVOICE TOTAL	COUNTY TAX PAID	COUNTY OF SALE *
				$	$	
				TOTAL:	$	

* If this is an out-of-state vendor, the County of Sale should be the county to which the merchandise was shipped.

DIVISION 00

PA Form 1

AFFIDAVIT AND WAIVER OF LIEN
PRIME CONTRACTOR

STATE OF _____

COUNTY OF _____

Personally appeared before me, the undersigned Notary Public for said County and State _____ (Name of Individual), _____ (Title) of _____ (Prime Contractor), who being duly sworn by me states on oath that all product suppliers and Subcontractors, payrolls, sales tax, privilege tax or license, old age benefits tax, state and federal unemployment insurance, and other liabilities incurred in the performance of _____ (Type of Contract) Contract for the construction of improvements at _____ (Name of Project), have been paid in full and that the above named Prime Contractor waives any claims and releases _____ (Owner) from any rights or claims (including lien rights) for debts due and owing by virtue of the furnishing of any labor, products, and supplies furnished for such improvements.

The above named Prime Contractor agrees to indemnify the Owner and save him harmless on account of any loss he may sustain in reliance upon this Affidavit and Waiver of Lien including the amount of any lien he may be compelled to pay all costs relating thereto and a reasonable attorney's fee.

_____
(Prime Contractor)

By:_____

Title:_____

Date:_____

Sworn to and subscribed before me

this _____ day of _____, 20____

_____
Notary Public

My Commission Expires: _____

DIVISION 00

PA Form 2

RELEASE AND WAIVER OF CLAIMS BY SUBCONTRACTORS AND PRODUCT VENDORS

STATE OF _____

COUNTY OF _____

Personally appeared before me the undersigned authority in and for said County and State _____ (Name of Individual),_____ (Title) of _____(Company), who, being duly sworn by me states on oath that all bills for labor and products, sales tax, privilege tax or license, old age benefits tax, state and federal unemployment insurance and other liabilities have been paid in full, or that funds are in hand to discharge such liabilities when due, incurred in the performance of its Subcontract for furnishing labor or products in the construction of improvement at _____ (Name of Project), _____ (Location), upon receipt of check in the amount of $ _____, the undersigned company waives any claims and releases _____(Owner) and _____ (Contractor) from any rights or claims for debts due and owing by virtue of the furnishing of any labor or products and any lien therefore.

_____

By: _____

Title: _____

Date: _____

Sworn to and subscribed before me

this _____ day of _____, 20_____

_____
Notary Public

My Commission Expires: _____

DIVISION 00

PA Form 3

CONTRACTOR'S AFFIDAVIT AS TO STATUS OF LIENS

STATE OF _____

COUNTY OF _____

Personally appeared before me, the undersigned Notary Public for said County and State, _____ (Name of Individual), _____ (Title) of _____ (Prime Contractor), who being duly sworn by me states on oath that to the best of his knowledge and belief, except as listed below, the Releases and Waivers of Claim attached hereto include all Subcontractors and all suppliers of labor, products, and equipment provided by all persons who may have liens against the property of _____ (Owner), located at _____(Location of Project), arising out of the construction of improvements thereon.

Exceptions: (If none, write "NONE." Any exception listed shall be bonded by the Contractor to indemnify the Owner, and a copy of each such bond shall be attached hereto.)

1.

2.

3.

_____
(Name of Company)

By:_____

Title:_____

Date:_____

Sworn to and subscribed before me

this _____ day of _____, 20_____

_____
Notary Public

My Commission Expires: _____

DIVISION 00

PA Form 4

Date _____
(Date Project Accepted by Owner)

GENERAL GUARANTEE

_____ (Name of Contractor) guarantees all products and workmanship incorporated in the _____ (Name of Project), _____(Location), against defect due to faulty products or faulty workmanship or negligence for a period of (12) twelve months for the General Guarantee and a period of (24) twenty four months for incidental building watertightness not covered by specific Sections of the Project Manual as set forth in the General Conditions and the Supplementary Conditions or for such longer periods as may be designated by specific Sections of the Project Manual.

He shall, immediately upon notification by the Owner of water penetration, determine the source of water penetration and, at his own expense, do any and all work necessary to return the building to a watertight condition. He shall also, at his own expense, repair or replace any other damaged products, finishes, and furnishings, damaged as a result of this water penetration, to return the building to its original condition.

This guarantee is binding where defects occur due to normal usage conditions and does not cover willful or malicious damage, damage caused by acts of God, or other casualty.

_____
(Contractor)

By:_____

Title:_____

Date:_____

Sworn to and subscribed before me

this _____ day of _____, 20____

_____
Notary Public

My Commission Expires:_____

DIVISION 00

PA Form 5

Date: _____
(Date Project Accepted by Owner)

ROOFING AND SHEET METAL GUARANTEE

Notwithstanding and in addition to the roofing products manufacturer's guarantee, _____ (Name of Roofing Contractor/Subcontractor) guarantees all products and workmanship incorporated in the _____ (Name of Project), _____(Location), against defects due to faulty products, negligence, and poor and/or faulty workmanship for a period of 24 months as set forth in the General Conditions, Supplementary Conditions, Roofing Specification Section _____, and Sheet Metal Flashing and Trim Specification Section _____.

Notwithstanding and in addition to the roofing products manufacturer's guarantee, blisters, buckles, curled edges, fish mouths, splits, wrinkles, damaged insulation, damaged vapor retarder loose flashings, deteriorating flashings, deteriorating flashing caulking, etc., shall be considered as evidence of poor and/or faulty workmanship and products and shall be repaired when discovered during the annual roof inspections of this guarantee. This guarantee is binding where defects occur due to normal usage conditions and does not cover willful or malicious damage and damage caused by acts of God or other casualty.

As a condition of this guarantee, the Contractor and the Roofing Contractor/Subcontractor agree to make 2 annual roofing system inspections, in the presence of the Owner, prior to the expiration of the 2-year guarantee period.

The Owner will call for the date and time for the annual inspections at the end of the first year and at the end of the second year.

He shall, immediately upon notification by the Owner of water penetration, determine the source of water penetration and, at his own expense, do any and all work necessary to return the building to a watertight condition. He shall also, at his own expense, repair or replace any other damaged products, finishes, and furnishings, damaged as a result of this water penetration, to return the building to its original condition.

_____	_____
(Roofing Contractor/Subcontractor)	(Contractor)
By: _____	By: _____
Title: _____	Title: _____
Date: _____	Date: _____
Sworn to and subscribed before me	Sworn to and subscribed before me
this ___ day of _____, 20____	this ___ day of _____, 20___
_____	_____
Notary Public	Notary Public
My Commission Expires: _____	My Commission Expires: _____

DIVISION 00

SECTION 00 65 06: WATERTIGHTNESS GUARANTEE

PA Form 6

Date _____
(Date Project Accepted by Owner)

WATERTIGHTNESS GUARANTEE

(Does *not* include **Roofing and Sheet Metal Guarantee** if applicable to Project)

_____ (Name of Subcontractor/Manufacturer) guarantees all products and workmanship incorporated in the _____ (Name of Project), _____ (Location), against defect due to faulty products or faulty workmanship or negligence for a period of (60) sixty months for watertightness guarantee covering work in Section _____ as set forth in the General Conditions and Supplementary Conditions or for such longer periods as may be designated by specific Sections or of the Supplemental Sheets of these Specifications.

He shall, immediately upon notification by the Owner of water penetration, determine the source of water penetration and, at his own expense, do any and all work necessary to return the building to a watertight condition. He shall also, at his own expense, repair or replace any other damaged products, finishes, and furnishings, damaged as a result of this water penetration, to return the building to its original condition.

This guarantee is binding where defects occur due to normal usage conditions and does not cover willful or malicious damage, damage caused by acts of God or other casualty.

_____	_____
(Subcontractor of Manufacturer)	(Contractor)
By:_____	By:_____
Title:_____	Title:_____
Date:_____	Date:_____

Check the following as applicable:

☐ Subcontractor ☐ Manufacturer

Sworn to and subscribed before me	Sworn to and subscribed before me
this _____ day of_____,20____	this _____ day of_____,20____
_____	_____
Notary Public	Notary Public
My Commission Expires: _____	My Commission Expires: _____

DIVISION 00

SECTION 00 65 07: LANDSCAPE PLANTS AND/OR GRASS GUARANTEE

PA Form 7

Date _____
(Date Project Accepted by Owner)

LANDSCAPE PLANTS AND/OR GRASS GUARANTEE

_____ (Name of Contractor) guarantees all products and workmanship incorporated in the _____ (Name of Project), _____ (Location), against defect due to faulty products or faulty workmanship or negligence for a period of (1) one 12 month cycle which will include (1) one full growing season for plants and (1) one full year for grass for the general guarantee for plants and/or permanent grass furnished and planted for this Project as is required by the specific Sections of the Specifications.

He shall, immediately upon notification by the Owner of an apparent defect in the condition of any plant and/or grass area, determine the extent and degree of the defect and, at his own expense, do any and all work necessary, including furnishing and planting new plants and/or grass, to correct the defect. He shall also, at his own expense, repair or replace any other damaged work, finishes, and other construction damage as a result of any defect to return the landscaping to its original finished condition.

All plants shall be guaranteed to live through (1) one full growing season, March 1 to October 31. If plants are planted after March 30, the growing season guarantee shall start on March 1 of the next year. If plants are found to be dead, dying, or of poor appearance at any time during this period, they shall be removed and replaced with new plants at no additional cost. Any plant that dies, or is in an unhealthy condition prior to acceptance, shall be replanted and this replacement shall not be considered as a guarantee replacement. All replacements shall be made with plants of the same kind, in the same manner as specified for original planting, at no additional cost. All plants including replacement plants, that have been found to be dead, dying, or of poor appearance shall be immediately removed and the Owner notified. Replacement of trees and large shrubs shall be made at the beginning of the next planting season and shall be guaranteed for its full growing season. Replacement of small shrubs and ground covers shall be made within 30 days following the inspection that determined the required replacement. The Owner shall be

notified prior to all replacement work. The Contractor shall guarantee for (1) one full year a live and vigorous stand of permanent grass at the time of acceptance of the work consisting of:

(A) 80 percent minimum live coverage for seeded grass with no bare spots greater than 3 square feet spaced no closer than 10', the total of which shall not exceed 20 percent of the grassed area, or

(B) 3 live sprigs each square foot for sprigged grass, or

(C) 100 percent live coverage for sodded grass, as applicable.

This guarantee is binding where defects occur due to normal usage conditions and does not cover willful or malicious damage, damage caused by acts of God, or other casualty.

_____	_____
(Landscape Contractor/Subcontractor)	(Contractor)
By: _____	By: _____
Title: _____	Title: _____
Date: _____	Date: _____
Sworn to and subscribed before me	Sworn to and subscribed before me
this ____ day of _____, 20_____	this ____ day of _____, 20 _____
My Commission Expires: _____	My Commission Expires: _____

DIVISION 00

SECTION 00 72 00: GENERAL CONDITIONS OF THE CONTRACT

A. DEFINITIONS

1. The Contract Documents consist of the Construction Agreement, Instructions to Bidders, General Conditions of the Contract, the Contract Documents and the accepted proposal.

2. The AIA® Document A201™-2017 General Conditions will be considered a part of these Contract Documents. A copy of AIA® Document A201™-2017 is herein attached or if not attached may be obtained by writing AIA Headquarters, 1735 New York Avenue, Washington, DC 20006-5292 or may be examined at the Architects office.

3. The Owner and the Contractor are those mentioned as such in the Construction Agreement.

4. The Architect is:

Pinnacle Architecture, P.A.
PO Box 187, (630 Team Road, Suite 200)
Matthews, North Carolina, 28106 (28105)
Telephone: 704/847-9851 FAX: 704/847-9853

5. The term "Work" of the Contractor or any of his Subcontractors includes labor, materials or both.

B. CORRELATION AND INTENT OF THE DOCUMENTS

1. The Contract Documents are complementary and what is called for by any one shall be as binding as if called for by all. The intention of the documents is to include all labor, materials, equipment, and transportation necessary for the proper execution of the work. It is not intended, however, that materials or work not covered by or properly inferable from the heading, branch, class or trade of the specifications shall be supplied unless distinctly so noted on the drawings. Materials or work described in words which so applied have a well-known technical meaning or trade meaning shall be held to refer to such recognized standards.

2. The Specifications are intended to be typical and complete with only the applicable items of material used. However, the items of material as required by the drawings are not limited to those noted in the specifications.

3. Bidders are required to carefully examine SECTION 00 91 13: SUPPLEMENTAL SHEETS. Note all deletions, additions and corrections made to the specifications.

4. Manufacturer's names and brands are mentioned in the sections of the Specifications, which follow in order to establish the type, quality, and dimensions for any one product. For items specified "or equal", the Contractor may use a product or brand other than that specified, but must submit to the Architect the data and/or samples of the proposed products and brands to be used, along with

samples of the product specified for comparison. If considered to be an equal to that specified in the opinion of the Architect, it will be approved in writing. No substitutions will be permitted without the written approval of the Architect.

5. All "or equal" approvals shall be obtained before bidding. Such approvals during construction will be extremely difficult to obtain.

6. Where dimensions are given on the drawings, said dimensions are to be followed in preference to measurements obtained by scale. Where no dimension is given, Architect is to be contacted for interpretation.

C. THE ARCHITECT'S STATUS

1. The Architect is the interpreter of the Contract Documents. The Architect is the agent of the Owner, only to the extent provided for in the Contract Documents, and when, in special instances, he is authorized by the Owner to so act; and in such instances, he shall, upon request, show the Contractor written authority.

D. PRIME CONTRACTORS

1. All Prime Contractors and their sub-contractors shall cooperate in the execution of the work and shall plan their work in such manner as to avoid conflicting schedules or delay of the work.

2. If any part of a Prime Contractor's work depends upon the work of another contractor, defects which may affect that work shall be reported to the Architect 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 develop. The Architect shall be the judge as to quality of work and shall settle all disputes on the matter between contractors.

3. Any mechanical, electrical or plumbing work such as sleeves, inserts, chases, etc. which is located in the work of the General Contractor shall be built in by the General Contractor under the competent supervision of a qualified representative of such mechanical and/or electrical contractor. The responsibility for the exact location of such items shall be that of the mechanical, electrical, or plumbing contractor.

4. Each Contractor or Subcontractor shall leave all such chases, holes, or openings straight, true, and of the proper size in his own work as may be necessary for the proper installation of another Subcontractor's work, consulting with the Subcontractor concerned regarding proper location and size of same. No excessive cutting will be permitted nor shall any piers or other structural members be cut without the consent of the Architect. After such work has been installed, he shall carefully fit around, close up, repair, patch and point up same as directed, to the entire satisfaction of the Architect. All this work shall be done with the proper tools and by careful workmen of the particular trade to which such work belongs, and shall be done without any extra charge to the Owner.

E. SEPARATE CONTRACTS

1. The Owner reserves the right to let other contracts in connection with the work. The Contractor shall afford other Contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall properly connect and coordinate his work with theirs.

F. PROJECT EXPEDITER

1. It shall be the responsibility of the General Contractor to schedule the work of all prime contractors; to maintain a progress schedule for all prime contractors for this project; and to notify the designer of any changes in the progress schedule. He shall be responsible for providing adequate notice to all prime contractors to insure efficient continuity of all phases of the project work. The General Contractor will be "Project Expediter."

2. Designation as "Project Expediter" entails an additional project control responsibility and does not alter in any way the responsibilities of the other Prime Contractors.

3. Each other Prime Contractor is held responsible for keeping the "Project Expediter" fully informed as to his work progress, including immediate notification of any work progress changes.

4. It will be the responsibility of each Prime Contractor to initiate and maintain such programs as may be necessary to comply with Section 107 of the Contract Work Hours and Safety Standards Act (86. Stat. 96; 40 U.S.C. 327) commonly known as the Construction Safety Act, as published in Volume 36, Number 75 of the Federal Register dated April 17, 1971, or as amended.

G. CONSTRUCTION SUPERINTENDENT

1. Each Contractor shall keep a thoroughly competent Superintendent on the work during its progress. If observed to be inattentive to the requirements set forth in these documents and/or the work in progress the superintendent may be removed from the project at request of the Architect.

H. PERMITS AND/OR LICENSES

1. The Contractor shall pay for any building permits necessary in connection with the work unless otherwise indicated. The Contractor (each prime contractor) shall obtain and prepare all necessary paperwork. The Contractor(s) shall file for and obtain the permits.

I. DRAWINGS FOR JOB USE

1. All complete sets of plans and specifications used in bidding the project shall be issued to the successful Contractor. These shall be picked up and signed for at the office of the Architect. Any additional set requested shall be furnished at reproduction and postage costs. Upon completion of the work, and before final acceptance, all sets of drawings and specifications must be returned to the office of the Architect who will issue a receipt for same.

J. OWNERSHIP OF DRAWINGS

1. All drawings, specifications, and copies furnished by the Architect are his property. They are not to be used on other work, and with the exception of the signed contract set, are to be returned to him on request at the completion of the work.

2. The Owner shall, upon full payment of all compensation due to the Architect obtain the rights and privileges to use the drawings and specifications prepared under this agreement. For such consideration, the Owner assumes the responsibility and liability for all damages, direct and indirect, for the future use of the documents. In addition, the Owner shall defend, indemnify and hold the Architect harmless from any and all costs, obligations or liability arising from law suits or threatened law suits by any person, firm or corporation arising from the future use of the documents, including payment of the Architect's defense cost and legal fees. The Owner acknowledges that the documents are site specific and shall not use the drawings and specifications for execution of any project, including renovations and additions, other than that for which it was originally developed, nor shall the Owner give, bequeath or sell the drawings or specifications to others under any circumstances, except by agreement in writing with the appropriate compensation to the Architect. The Architect may retain copies of the original documents and has full rights to reuse their content and reserves the right to remove his title block and seal from any reproducible copies provided the Owner.

K. EXTRA AND/OR ADDITIONAL WORK CHANGES

1. The Contractor shall not make any changes or do any extra or additional work, or both, without the prior written approval of the Architect.

L. ASSIGNMENT OF CONTRACT

1. Neither this contract nor any monies due, or to become due there under, may be assigned by the Contractor without the prior written approval of the Architect.

M. SUB-CONTRACTING

1. No part of this Contract shall be sublet without the prior written approval of the Architect.

N. MEASUREMENTS

1. Before ordering any materials or doing any work, each Subcontractor shall verify all measurements at the building and shall be responsible for the correctness of same. No extra charge or compensation will be allowed on account of differences between the actual dimensions and the measurements indicated on the drawings.

O. COMMENCEMENT AND COMPLETION OF THE WORK

1. The Contractor shall commence work under his contract upon receipt of Notice to Proceed (reference AIA® Document A201™-2017, Section 3.1), shall expedite the work to the best of his/her ability and shall fully complete same within as short a time as conditions affecting the work will permit.

P. LIQUIDATED DAMAGES FOR FAILURE TO FURNISH SECURITY FOR AND EXECUTE CONTRACT

1. If the successful bidder fails to provide security for and execute the Contract as provided herein and in the general conditions within ten (10) days after notice of acceptance of his proposal, the bid check for bidder's bond submitted with his bid shall be forfeited to the Owner as liquidated damages.

Q. USE OF PROPOSAL FORM

1. All proposals shall be made on the form issued with the other documents and signed in longhand. All blank spaces in the form shall be filled out. All spaces left blank will be read zero (0) or no change.

R. LICENSE

1. All bidders must be registered and licensed to do general contracting in the state in which the building is to be erected. All Subcontractors must be licensed Contractors.

S. INSURANCE CONTRACTOR'S COVERAGE

1. The Contractor shall not commence work under this Contract until all insurance required under SECTION 00 73 00: Supplementary General Conditions of the Contract - Article 11 hereof has been obtained, and such insurance has been approved by the Owner, nor shall the Contractor allow any Subcontractor to commence work on his subcontract until all similar insurance required of the Subcontractor has been so obtained and approved.

T. MAINTENANCE AND GUARANTEE

1. The contractor shall warrant and provide a performance bond to assure the Owner's interests as follows:

    a. The Contractor shall bind all of the Subcontractors with him in warranties hereinafter required. Their performance bond shall remain in force for a period of one year from the date of acceptance of the work covered by this Contract as a guarantee that the Contractor will, at his own expense, repair or replace and make good all defects of material or workmanship, in connection with this contract, which may develop during the period of warranty.
    b. In addition to the performance bond, the Contractor shall guarantee all built-up and single membrane roofing and flashing for a period of two (2) years after a certificate of occupancy is acquired. Shingle roofs and single membrane roofs will be factory warranted for a period of not less than twenty (20) years.
    c. If, at any time during the warranty period, defects of materials or workmanship, from any cause whatsoever, shall develop or become evident through inspection, the Contractor shall, at his own expense, replace or repair the parts affected. If the Owner shall deem it necessary and so order, such repairs or replacements shall be commenced within 48 hours after the serving of notice, and shall be completed without delay.

Should the Contractor, after due notice, refuse or neglect to make good the defects as notified, then the Owner is empowered to proceed to make good all such defects by whatsoever means they see fit. In such instances, all the actual expenses incurred thereby for remedying such defects shall be billed to and paid for by the Contractor, or in case of his default, his surety shall become liable for and pay for all such expenses.

d. The Contractor further guarantees the entire equipment, fixtures, piping, apparatus, etc., as installed and connected under his contract to perform all of the duties specified or expected under the condition notes without failure, defects, etc., for a period of one year after the date of acceptance by the Owner. Where no definite performance of equipment is specified, the equipment as installed and connected shall be guaranteed by the Contractor to equal the best and most efficient performance of the equipment as specified by name or performance.

U. SIGN:

1. Refer to detailed drawing of project identification sign contained in SECTION 01 58 13: Project Sign. If not shown herein, the Architect will issue a drawing of same. All projects will have a construction sign identifying the project, the Architects and all Prime Contractors. Location of sign will be by Architect at pre-construction. Project sign must be in place before first pay request will be considered.

DIVISION 00

SECTION 00 73 00: SUPPLEMENTARY GENERAL CONDITIONS OF THE CONTRACT

00 73 00.01: GENERAL

1. General Conditions of the Contract for Construction, American Institute of Architects Document A201™ dated 2017 will be considered part of these specifications. These Supplementary General Conditions contain changes and additions to the AIA® General Conditions, Document A201™-2017. Where any portion of an AIA General Conditions Article is modified or voided in part by the Supplementary Conditions the unaltered provisions shall remain in effect. A copy of the AIA® General Conditions, Document A201™-2017 may be examined at the Architect's office.

2. All references in Articles 8.3.1, 15.3.2 and 15.4 to arbitration in accordance with the construction arbitration rules of the American Arbitration Association shall be deleted. It is the specific intent that where interpretations of the Architect, given in writing as final, remain, in dispute by either the Owner or the Contractor and said disputes cannot be amicably resolved by the parties, final settlement will be made by the courts having jurisdiction.

ARTICLE 1 – GENERAL PROVISIONS:

1.1 BASIC DEFINITIONS: Add the following Subsection:

1.1.6.1 Specification Terms:

"Or Approved Equal" and "Equal To": Shall mean products by manufacturers other than those specified in the Project Manual and Addenda which the Contractor may submit for substitution and prove to be equal to those specified in the Project Manual and Addenda and on the drawings and which may be incorporated in the work after review and concurrence by the Architect and acceptance by the Owner.

"Provide": Shall mean furnish and install complete, in place, and ready for use.

"Indicated" and "Shown": Shall mean as detailed, scheduled, or called for in the Contract Documents.

"Latest Edition": Shall mean the current printed document issued up to thirty (30) calendar days prior to date of receipt of bids.

"Quality": Shall mean the meticulous attention to the detail of installation and workmanship necessary to the assemblage of products in the highest grade of excellence by skilled craftsmen of the trade.

"Prime Contractor": These documents are written to encompass "multi prime" bidding. Where "Prime Contractor" appears (in a single prime bidding scenario) read as "General Contractor".

1.1.9 Divisions of Responsibility: Add the following Section:

The following responsibilities are in addition to those called for in the General Conditions and in these Supplementary Conditions.

The Architect is responsible for general overall design and not for product design, product fabrication, and construction.

The Contractor is responsible for overall construction and safety.

The Subcontractor is responsible to the Contractor for the proper construction of and proper design when called for, the work under his Subcontract.

The manufacturer is responsible to the Subcontractor and the Contractor for product design and product fabrication.

The Owner is responsible for proper maintenance and proper usage after completion and acceptance of the Project.

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS:

1.2.2.1 Add the following Subsection:

Such dividing of the work shall not operate to make the Architect an arbiter to establish limits of work between Subcontractors or between Contractor and Subcontractor. The General Contractor is the "Project Expeditor" and will operate and be responsible in that capacity.

1.2.3 Add the following to the existing Section:

All work shall conform to Contract Documents. No change there from shall be made without a review by Architect. Where only part of the work is indicated, similar parts shall be considered repetition. Where any detail is shown and the components therefore are fully described, similar details shall be construed to require equal products and construction.

Add the following Sections:

1.2.4 Should drawings disagree in themselves or with specifications, the better quality or greater quantity of work or material shall be furnished, unless otherwise ordered in writing.

1.2.5 Contractor will understand that work herein described shall be completed in every detail. Contractor will be held to provide labor and material necessary for entire completion of work intended to be described, and shall not avail him of any manifestly unintentional error or omission, should same exist.

1.2.6 Preference shall be given to calculated dimensions on drawings rather than measurements by scale. Contractor shall report any error or inconsistency noted in dimensions to the Architect before commencing work.

1.2.7 In such cases where the nature of the work requires clarification by the Architect, such clarification shall be furnished with reasonable promptness by means of written instructions or detail drawings, or both. Clarifications and drawings shall be consistent with the intent of documents and become a part thereof.

ARTICLE 2 - OWNER

2.1 GENERAL: Add the following Section:

2.1.3 The Owner, when referred to throughout the Contract Documents, shall be as listed in Advertisement for Bids and/or Instructions for Bidders contained herein.

2.3 INFORMATION AND SERVICES REQUIRED OF THE OWNER:

2.3.7 Add the following Section:

The Owner reserves the right to have his authorized representative and agents inspect all work, materials, payrolls, records of personnel, invoices of materials, and other relevant data and records.

ARTICLE 3 - CONTRACTOR

3.1 GENERAL:

3.1.4 Add the following Section:

Only one (1) Contractor is recognized as a party to the Contract and the term "Contractor" refers to the Contractor who signed the Contract. When the Owner executes separate Contracts, the term "Prime Contractor" is used to distinguish these from the Subcontractor.

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR:

3.2.1 Add the following Subsection:

The Contractor shall carefully study and compare the Contract Documents with each other and with information furnished by the Owner pursuant to Subparagraph 2.2.3 and shall at once report to the Architect errors, inconsistencies or omissions discovered.

If Contractor fails to give such notice and, knowingly, proceeds with incorrect work, he shall correct any such errors, inconsistencies or omissions at no additional cost. Should the Specifications and Drawings fail to particularly describe the product or kind of goods to be used in any place, then it shall be the duty of the Contractor to make inquiry of the Architect for what is best suited. The product that would normally be used in this place to produce first quality finished work shall be considered a part of the Contract.

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES:

3.3.4 Add the following Section:

The Contractor has the responsibility to ensure that all product suppliers, and Subcontractors, their agents and employees, adhere to the Contract Documents and that they order products on time. The Contractor shall coordinate his work with

that of all others on the Project including for deliveries, storage, installations, and construction utilities. The Contractor shall be responsible for the space requirements, locations, and routing of his equipment. In areas and locations where the proper and most effective space requirements, locations, and routing cannot be made as indicated, the Contractor shall meet with all others involved, before installation, to plan the most effective and efficient method of overall installation. A general example is equipment above corridor ceilings where ductwork, piping, conduit, lights, etc., will be installed. A thorough coordinated plan shall be used to install the equipment to furnish proper clearances, radii of turns, locations, pipe slopes, supporting appurtenances, and access where required.

3.4 LABOR AND MATERIALS: Add the following Section:

3.4.4 All materials and labor shall be in strict accordance with all governing rules and regulations of the State and any and all local rules, laws, or ordinances governing or otherwise appertaining thereto. All contractors are required to comply with Public Law 91- 54, "Federal Construction Safety Act of 1969", and Public Law 91- 596, "Occupational Safety and Health Act of 1970" with amendments through January 1, 2004, or its latest revision.

3.5 WARRANTY: Add to the existing Section:

3.5.1 All warranties shall include labor and products and shall be signed by the manufacturer or subcontractor, as the case may be, and countersigned by the Contractor. All warranties shall be addressed to the Owner and delivered to the Architect upon completion of the project and before or with the submission of request for final payment.

Add the following Sections:

3.5.3 Except where a longer guarantee time is specifically called for in the Specification Sections, the general guarantee shall be for twelve (12) months. Material, equipment, and labor replaced during the warranty period will be guaranteed for twelve (12) months after the replacement of same. The Contractor shall make good such defective materials, equipment or workmanship within the stipulated guarantee period without cost to the Owner.

3.5.4 The Contractor signing a Contract with the Owner shall issue to the Owner a "General Guarantee," PA Form 4, for all work under his Contract. It shall cover incidental building watertightness not covered by specific Sections of these Specifications. It shall not include the individual specific guarantees for watertightness and roofing and sheet metal.

3.5.5 The Contractor signing a Contract with the Owner shall issue to the Owner a "Watertightness Guarantee," PA Form 6, for each Section of these Specifications covering such that is under his Contract. Submit a separate guarantee for each Section requiring a guarantee for watertightness. This guarantee shall not include the guarantee for roofing and sheet metal.

3.5.6 The Contractor signing a Contract with the Owner shall issue to the Owner a "Roofing and Sheet Metal Guarantee," PA Form 5, which is in addition to that to be issued by manufacturers of products.

The Contractor signing a Contract with the Owner shall issue to the Owner a "Landscape Plants and/or Grass Guarantee," PA Form 7.

3.5.7 The Contractor signing a Contract with the Owner shall obtain and forward to the Owner any and all guarantee issued by the manufacturers specifically for certain products and systems covered under his Contract. In the event the manufacturer does not have a suitable "preprinted warranty form" to fully cover the guarantee requirements as set forth in the Specification Section, he shall produce a warranty form patterned after those contained hereinafter which shall fully document the guarantee as set forth in the Specification Section.

3.5.8 Warranties shall become effective on a date established by the Architect. This date generally shall be the date of Final Acceptance of the Total Project, or shall be at Substantial Completion should it become expedient for the Owner to accept portions of the work prior to total completion of the Total Project.

3.5.9 In the case of Substantial Completion, separate warranties shall be issued for those specific portions of the Total Project which were accepted and shall be dated the date the specific portion was accepted. As additional work is accepted, separate warranties for those specific portions of the work shall be issued and properly dated. Substantial Completion Reviews and Acceptance will be considered when the progress of the Project conforms to Paragraph 8.1.3.

3.5.10 Substantial Completion Acceptance shall in no way become the basis for Application for Final Payment nor shall it become a means by which the Contractor and his Subcontractors, Sub-Subcontractors, product suppliers, etc., may sue to obtain early acceptance and warranty dates.

3.5.11 In the event that the Architect considers it impractical, because of unsuitable test conditions, or some other factors, to execute simultaneous final acceptance of all equipment, portions of the installation may be certified by the Architect for final acceptance when that portion of the system is complete and ready for operation as called for in Paragraph 9.8.

3.5.12 The Contractor shall guarantee for a period of TWENTY-FOUR (24) MONTHS that the building shall be watertight and leak proof at every point and every area, except where leaks can be attributed to damage to the building by external forces beyond his control. He shall, immediately upon notification by the Owner of water penetration, determine the source of water penetration and, at his own expense, do any work necessary to make the building watertight. He shall also at his own expense, repair or replace any other damaged material, finishes, and furnishings, damaged as a result of this water penetration to return the building to its original accepted condition.

3.5.13 If, for any reason, the Contractor cannot guarantee any part of his work using products or construction methods which have been specified, or shown, he shall notify the Architect in writing before contracts are signed, giving reasons, together with the names of products and data on substitutions he can guarantee.

Should the Contractor fail to so notify the Architect prior to the Signing of Contracts, he will be held to have agreed to guarantee all work specified or shown.

3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES:

3.10.1.1 Add the following Subsection:

General Contractor, or Project Expediter, (see SECTION 00 72 00 GENERAL CONDITIONS of the CONTRACT) shall prepare a Progress Schedule as follows:
A proposed Progress Schedule shall be prepared covering all work on the Project and shall be submitted to the Architect for review within twenty (20) consecutive calendar days after the Notice to Proceed. Every Prime Subcontractor or every other Prime Contractor, as the case may be on the Project, shall submit to the preparer of the overall Progress Schedule, his Progress Schedule for the proper preparation of the overall Progress Schedule for the entire Project. Every Prime Subcontractor or every other Prime Contractor, as the case on the Project, shall cooperate with the preparer of the overall Progress Schedule, in the preparation of this document so that the work of all will be coordinated.

The Progress Schedule shall be in a bar chart form similar to the example bound hereinafter. The bar chart shall show the date when the operation of each Specification Section is to begin and is to be completed and its total dollar value percent to be completed each month. Each Progress Schedule, after the first submission, shall incorporate a progress barometer indicating the planned percent and actual percent of the total work completed by that Contractor as of the Progress Schedule date. The Progress Schedule shall be brought up-to-date each month showing actual progress in time and dollar value through that month and shall be submitted each month with the Application for Payment excluding the Application for Final Payment.

If any Contractor or Subcontractor at any time knows or has reason to believe that the delivery of any product or the shortage of qualified labor or delays caused by others or the occurrence of any other difficulty may cause a delay in carrying out the Progress Schedule, the Contractor i.e. "Project Expediter" shall notify the Architect in writing within three (3) days.

3.10.1.2 Add the following Subsection:

The purpose of the Progress Schedule and monthly updates as hereinbefore described, or as may be otherwise submitted and approved, shall be to furnish the Owner and Architect with information to indicate that the Contractor has planned the Project in sufficient detail for the Contractor to ensure that its construction can be accomplished within the stipulated time frame. The dollar value estimates to be included on the schedule are to assist the Owner in his cash flow planning so that funds will be readily available to pay Contractor Applications for Payment. Monthly updates are to furnish the Owner with current status of any changes required in the original schedule which will assist the Owner in scheduling delivery and installation of any products, furnishings, etc., necessary for the operation of the facility for its intended purpose.

The responsibility for construction planning and the effective efficient implementation of such, or the converse, to meet the Contract completion date, or authorized appropriate extensions thereof, are the total responsibility of the Contractor i.e. Project Expeditor and such responsibility shall not transfer to the Owner/Architect. Review of the original Progress Schedule and subsequent modifications thereto, by the Owner and/or the Architect, shall be limited to the general purposes set out above. Such approval shall not operate to imply the

agreement of the Owner/Architect to the Contractor's planned procedures, coordination, critical path scheduling, etc., as being appropriate or reasonable.

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES:

3.12.4.1 Add the following Subsection:

All shop drawings, product data, and samples shall be submitted to the Architect, through the Contractor, for review within thirty (30) calendar days after the Notice to Proceed. Samples and product data required for substitutions shall be submitted with the request for substitution. Shop drawings will **not** be considered for review on substituted products that have not been submitted as called for in SECTION 00 21 13: INSTRUCTIONS FOR BIDDERS, SECTION 00 72 00 – GENERAL CONDITIONS and SECTION 01 33 00: SHOP DRAWINGS AND SUBMITTALS or which have not been completely checked, approved, and stamped by the Contractor, Subcontractor, and Fabricator. Shop drawings shall be prepared showing the specific locations and installation requirements of the Project.

Samples shall be in triplicate, one (1) to be retained by the Architect and two (2) to be returned to the Contractor, one (1) of which is to be placed on file in the field office for comparison to the products delivered. Where full-size samples are required and specified to be installed on the Project, only one (1) sample will be required.

For each shop drawing required for the initial submission, submit four (4) copies not exceeding 24" x 36" in size. After Architect reviews, three (3) copies will be returned to the Contractor who may reproduce his required number of copies before returning the reviewed copy to the Fabricator. Should printed product data be required with the submission, one (1) copy will be retained by the Architect and the remainder submitted will be returned to the Contractor. When corrections are necessary and a resubmittal is not requested, one (1) copy of corrected "field use" drawings will be forwarded to the Architect for file purposes.

After the Electrical, Plumbing, Heating, Ventilating and Air Conditioning submittals have received a favorable review the Contractor shall submit to the Architect for the Owner three (3) copies of complete operating and maintenance manuals as called for in DIVISIONS 22, 23, 26 AND 28. Three (3) copies of similar manuals shall also be submitted for other than those in DIVISIONS 22, 23, 26 AND 28. These manuals, bound in a hard binder and indexed, shall be submitted not later than sixty (60) calendar days before occupancy and shall be received before final Certificate for Payment is issued.

The Architect's review of shop drawings, product data, or samples shall not relieve the Contractor of his responsibility for any deviation from the requirements of the Contract Documents unless the Contractor has informed the Architect in writing of such deviation at the time of submission and the Architect has given consideration to the specific deviation, nor shall the Architect's review relieve the Contractor from his responsibility for errors or omissions in the shop drawings, product data, or samples.

3.12.7.1 Add the following Subsection:

The Contractor shall make all corrections required after review by the Architect and shall resubmit the required number of corrected copies of shop drawings, new product data, or new samples in accordance with the Architect's review stamp. When corrections are necessary and a resubmittal is not requested, three (3) copies of corrected "field use" drawings will be forwarded to the Architect for file purposes. The Contractor shall direct specific attention in writing or on resubmitted shop

drawings, product data, and samples as to revisions other than the corrections requested by the Architect on previous submittals.

3.12.8.1 Add the following Subsection:

No portion of the work requiring submission of a shop drawing, product data, or sample shall be commenced until the submittal has been reviewed and approved by the Architect.

ARTICLE 4 - ARCHITECT

4.2 ADMINISTRATION OF THE CONTRACT

4.2.6.1 Add the following Subsection:

Any instructions which the Architect may issue the Contractor shall be adjudged an interpretation of the Contract requirements and not an act of supervision. The Architect has no authority, nor accepts any responsibility, either direct or implied, to direct and/or superintend the work.

ARTICLE 5 - SUBCONTRACTORS

5.2 AWARDS OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK:

5.2.1 Add to the existing Section:

"As soon as practical" as stated above will be within fourteen (14) consecutive calendar days after the Construction Agreement. The list of Subcontractors and Craftsmen shall be enumerated in accordance with the Sections of these Specifications. Those listed on the Bid Form shall also be included.

5.3 SUBCONTRACTURAL RELATIONS: Add the following Section:

5.3.1 The Owner or Architect will not undertake to settle any differences between the Contractor and his Subcontractors or between Subcontractors.

ARTICLE 6 – CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.2 MUTUAL RESPONSIBILITY: Add the following Section:

6.2.6 Each Contractor agrees to coordinate his work with each other separate Contractor within the total time frame established by the preparer of the overall Progress Schedule i.e. Project Expediter and made a part of the agreement. This time frame shall be as called for in 3.10 PROGRESS SCHEDULE which requires the participation and agreement of all Contractors in its preparation and acceptance.

Should any Contractor or combination of Contractors allege that another Contractor or combination of Contractors has caused a delay in his Contractor or their Contract, then the Contractor or combination of Contractors causing the delay shall indemnify and hold harmless the Owner and the Architect from any cause of action, resulting from the alleged delay or delays and the responsible Contractor or combination of Contractors shall bear all

costs and expenses, including all attorneys' fees and court costs, which the Owner and/or Architect may have incurred in the resolution of such claim or claims.

ARTICLE 7 – CHANGES IN THE WORK

7.2 CHANGE ORDERS:

7.2.1 Add to the existing Section:

All Change Orders shall be approved by the Owner and Architect BEFORE the Contractor begins the work covered by the Change Order.

ARTICLE 8 - TIME

8.2 PROGRESS AND COMPLETION: Add the following Section:

8.2.4 The work will not be considered suitable for Substantial Completion Review until all Project systems are operational as designed; all designated or required governmental inspections and certifications have been made and posted, designated instruction of Owner's personnel in the operation of systems has been completed, and all final finishes are in place. In general, the only remaining work shall be minor in nature, such that the Owner could occupy the building on the following date and the completion of the work by the Contractor would not materially interfere or hamper the Owner's normal business operation. As a further condition of Substantial Completion Acceptance, the Contractor shall certify that all remaining work will be completed within thirty (30) consecutive calendar days following the date of Substantial Completion, and the failure to do so shall automatically reinstitute the provisions for damages due the Owner as contained elsewhere in the Agreement or as provided by law or such period of time as may be required by the Contractor to fully complete the work whether the Owner has occupied the work or not.

Exceptions to the above conditions for acceptance of designated portions of the Project, or other conditions of whatever kind, may be instituted by and in the sole discretion of the Owner, subject to concurrence of the Contractor; or, unless otherwise provided for elsewhere in the Agreement. The Owner may not reasonably withhold acceptance of the Total Project after Certification of Completion by the Architect.

8.3 DELAYS AND EXTENSIONS OF TIME:

8.3.4 Add the following Section:

Requests for extensions of construction time due to adverse weather conditions shall include U.S. Weather Bureau Climatological Reports for the months involved plus a report indicating the average precipitation, temperature, etc., for the past ten (10) years from the nearest reporting station. The 10-year average will determine the number of adverse weather days which the Contractor would normally expect to encounter. Extensions of time may be requested for any month of construction for days lost due to adverse weather in excess of the expected lost time.

8.3.5 Add the following Section:

Extension of time shall be Contractor's sole remedy for delay unless the same shall have been caused by acts constituting intentional interference by the Owner with Contractor's performance of the work and where and to the extent that such acts continue after Contractor's notice to Owner of such interference. Owner's exercise of any of its rights under ARTICLE 7 CHANGES IN THE WORK regardless of the extent or number of suspensions of the work, or requirement of correction or re-execution of any defective work, shall not under any circumstances be construed as intentional interference with the Contractor's performance of the work.

ARTICLE 9 –PAYMENTS AND COMPLETION

9.2 SCHEDULE OF VALUES:

9.2.1 Add the following Subsection:
The schedule of values shall be listed in numerical order of the Sections of the Specifications, and shall include: Description of the item, quantities, and the labor, product and total Contact amount for each item. This schedule of values shall be dated and signed by the Contractor.

General and Plumbing; Heating, Ventilating, and Air Conditioning; and Electrical Contracts or Subcontracts, as the case may be, shall be broken down in accordance with the Table of Contents.

9.3 APPLICATIONS FOR PAYMENT: Add the following Section:

Each month the Owner will make a progress payment to the Contractor based on the Contractor's approved estimate and Application for Payment for work performed under this Contract during the preceding calendar month. Application for Payment shall list products and labor separately. The Owner will retain five (5) percent of the amount of each estimate and Application for Payment until final completion and acceptance of all work covered by this Contract.

A final payment including retained amounts and authorized additions and deductions will be made upon full completion and acceptance of all work covered by this Contract.

APPLICATION FOR PAYMENT WILL NOT BE APPROVED WITHOUT AN UPDATED PROGRESS SCHEDULE.

APPLICATION FOR FINAL PAYMENT WILL NOT BE APPROVED WITHOUT CONTRACT COMPLETION REQUIREMENTS IN PARAGRAPH 16.2.

9.3.1 Add to the existing Section:

The application shall be on AIA® Documents G702™ and G703™. The Contractor shall include on each monthly Application for Payment, AIA® Documents G702™ and G703™, the following statement if surety is required for the Project:

"We certify that the Surety for this Project has been duly notified of the amount of this request." Unless exception to pay is made by the Surety to the Architect within four (4) calendar days following the date of request, it will be assumed that the Surety concurs in the payment of this application. American Institute of Architects Documents G702™ and

G703™ may generally be obtained at office supply firms or directly from The American Institute of Architects, 1735 New York Avenue, N.W., Washington, DC 20006.

9.3.2.1 Add the following Subsection:

When Application for Payment includes products stored off the Project Site or stored on the Project Site but not incorporated in the Project, for which no previous payment has been requested, a complete description of such product shall be attached to the application. Suitable storage which is off the Project Site shall be bonded warehouse with the stored products properly tagged and identifiable for the Project. The Owner's written approval shall be obtained before the use of an off-site storage is made.

9.5 DECISIONS TO WITHOLD CERTIFICATION:

9.5.2 Add to the existing Section:

Any money withheld due to any of the preceding causes constitutes a waiver of the Contractor's right to interest as stipulated in Paragraph 13.5.

ARTICLE 11 – INSURANCE AND BONDS:

11.1 CONTRACTOR'S LIABILITY INSURANCE:

11.1.1 Add to the existing Section:

Certificate of Insurance shall be on an AIA® Document G715™.

11.1.1.1 Add to the following Subsection:

Certificates of Insurance shall be attached to each copy of the Agreement by the Contractor before they are returned to the Architect for the Owner's signature, and Certificates shall be addressed to the Owner in care of the Architect.

11.1.2 Add to the existing Section:

Without limiting any of the other obligations or liabilities of the Contractor, the Contractor shall purchase and maintain minimum insurance coverage as follows.

The Contractor shall include a waiver of subrogation to Owner and Architect, which applies to all insurance policies.

The Contractor shall purchase and maintain insurance coverage on his tools, equipment, and machinery and shall waive subrogation to Owner and Architect for damage thereto.

The amounts of the Contractor's Liability Insurance shall be written for not less than the following, or greater if required by law:

a. WORKMEN'S COMPENSATION:

1) Statutory
2) Employers Liability: $100,000/500,000/100,000

b. COMPREHENSIVE GENERAL LIABILITY:

1) Bodily Injury & Property Damage including Contractual Liability Coverage:
$500,000 each occurrence/1,000,000 aggregate

c. COMPREHENSIVE AUTOMOBILE LIABILITY:

1) Bodily Injury & Property Damage: $500,000

d. PREMISES LIABILITY COVERAGE:

1) Duration of the project.
$500,000 each occurrence/1,000,000 aggregate

Add the following Sections:

11.1.5 Contractors Installation Floater: Contractor and all Subcontractors are required to furnish evidence of insurance on materials that are intended for use on the Project that will become part of the building but are not stored within limits of the construction site. The Contractor shall furnish bonds in a surety company authorized to do business in project state in the amount of 100% of contract. Cost shall be included in proposal. Bonds shall not only guarantee faithful performance of contract, but shall further guarantee payment of all bills for labor and materials when said bills are due. Performance Bond and Labor and Material Payment are to be executed on latest AIA® Forms.

11.1.6 A Performance Bond and a Labor and Material Payment Bond are required. The Contractor shall obtain a Performance Bond and Labor and Material Payment Bond, acceptable to the Owner in a surety company authorized to do business in the state in which the Project is constructed for the full amount of the Contract Sum. The bond shall guarantee the Contractor's faithful performance of the Contract and the payment of all obligations arising there under. The bond shall remain in force until (1) the building has been completed and accepted by the Owner, (2) the provisions of all guarantees required by these Contract Documents have been fulfilled, and the time limitation for all guarantees has expired, or (3) until the time for the filing of all mechanics' lien has expired, whichever is longer, after which it shall become void. The Contractor shall pay all charges in connection with this bond as a part of the Contract. One executed copy of the bond shall be attached to each copy of the Contract before they are returned to the Architect for the Owner's signature.

11.1.7 This bond shall be written on AIA® Document A312™, latest edition. Copies of AIA® Document A312™ may be obtained from the local office supply or stationery store or maybe ordered from the American Institute of Architects, 1735 New York Avenue, N.W., Washington, D.C. 20006. A current Power-of-Attorney shall be attached to this bond. It shall be the Contractor's sole responsibility to abide by and conform to this section.

11.1.8 Contractor's Default: If the Contractor defaults, the Contractor of his Surety, if Surety is required, shall reimburse the Owner for any additional architectural fees for additional services made necessary because of the Contractor's default.

11.2 OWNER'S INSURANCE:

11.2.1 Add to the existing Section:

"Policy shall include coverage for all risks and all perils."

11.2.1.1 Add the following Subsection:

The Contractor shall be financially responsible for the deductible of any and all claims against the Owner's property insurance.

The following are additions to the 2007 Edition of the AIA® GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION A201™.

ARTICLE 16 - COMPLETION:

16.1 FINAL REVIEW AND ACCEPTANCE:

16.1.1 At the completion of the Project, two (2) reviews will be performed by the Architect to establish acceptance of the work.

The terminology of these reviews shall be:

PRELIMINARY REVIEW - will establish check list of items to be corrected and completed before the Final Review.

FINAL REVIEW - will determine whether items on the check list have been corrected and completed, and whether the Project can be accepted by the Owner.

16.1.2 On a date approximately fourteen (14) calendar days before the Time of Completion as set forth on the Owner-Contractor Agreement, or on an amended date agreed to by the Contractor and the Architect and approved by the Owner, a Preliminary Review will be held and a check list of items will be prepared for correction and completion before the Final Review.

16.1.3 At the Time of Completion as set forth in the Owner-Contractor Agreement, a Final Review will be held to determine completion for acceptance of the Project. If, after review by the Architect, all work appears to comply with the requirements of the Agreement, final payment will be made in accordance with the Agreement.

16.1.4 In the event all items of the Preliminary Review Check List have not been corrected or completed by the Contractor on the date of Final Review, except items for which an extension of time had been agreed upon, the Contractor shall be deemed to have neglected to prosecute the work properly, and subsequent reviews required by the Architect to substantiate final completion will be deemed an extra service to the Owner. For this extra service, the Architect will be reimbursed by the Owner in the amount of $200.00 each day or fraction thereof, per person, required to expeditiously review the major Divisions of the work in the total Project (General; Electrical; Heating, Ventilating, and Air Conditioning, Plumbing; etc.), for each subsequent review required.

Due to the Contractor's failure to complete the work as required, this reimbursement will be deducted from the funds due the Contractor by the Owner under terms of their Agreement. In addition to the above, the provisions of Paragraph 2.4 may be invoked by the Owner.

In lieu of the invocation of the provisions of Paragraph 2.4, the Owner may request the Architect to provide an Architectural Representative to more closely review the residual completion activities of the Contractor. For this service, the Architect will be reimbursed in the amount of $200.00 each day for each day or fraction thereof that the Owner considers it necessary for the Architectural Representative to visit the Project site. This reimbursement to the Architect will be deducted from funds due to Contractor by the Owner under the terms of their Contract. This reimbursement will be in addition to any liquidated damages that may become due the Owner, and shall be considered as compensation to the Owner for extra architectural services made necessary by the Contractor's failure to complete the work as scheduled.

16.2 CONTRACT COMPLETION REQUIREMENTS:

16.2.1 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 Architect, completion documents as enumerated below:

1. Warranties as set forth in Paragraph 3.5, including other Guarantees required by specific Sections of the Specifications, four (4) copies each.

2. Shop drawings, product data, operating and maintenance manuals as set forth in Paragraph 3.12.4.

3. Affidavit and Waiver of Lien Prime Contractor (PA Form 1), four (4) copies.

4. Release and Waiver of Claims by each Subcontractors and Product Vendors (PA Form 2), four (4) copies.

5. Contractor's Affidavit as to Status of Liens (PA Form 3), four (4) copies.

6. Contractor’s General Guarantee (PA Form 4), four (4) copies.

7. Contractor’s Roofing and Sheet Metal Guarantee, if applicable (PA Form 5), four (4) copies.

8. Contractor’s Watertightness Guarantee, if applicable (PA Form 6), four (4) copies.

9. Consent of Surety Company to Final Payment (Document G707™), four (4) copies.

10. Original As-builts.

In addition to the above, all other submissions and certifications required by other Articles and Sections of the Specifications shall be in the hands of the Architect before approval of final payment.

AIA® Document A201™ – 2017

General Conditions of the Contract for Construction

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

THE OWNER:
(Name, legal status and address)

THE ARCHITECT:
(Name, legal status and address)

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

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

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

TABLE OF ARTICLES

INDEX
(Topics and numbers in bold are Section headings.)

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

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

§ 1.1.2 The Contract

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

§ 1.1.3 The Work

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

§ 1.1.4 The Project

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

§ 1.1.5 The Drawings

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

§ 1.1.6 The Specifications

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

§ 1.1.7 Instruments of Service

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

§ 1.1.8 Initial Decision Maker

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

§ 1.2 Correlation and Intent of the Contract Documents

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

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

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

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

§ 1.3 Capitalization

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

§ 1.4 Interpretation

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

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

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

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

§ 1.6 Notice

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

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

§ 1.7 Digital Data Use and Transmission

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

§ 1.8 Building Information Models Use and Reliance

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

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

ARTICLE 2 OWNER

§ 2.1 General

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

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

§ 2.2 Evidence of the Owner's Financial Arrangements

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

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

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

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

§ 2.3 Information and Services Required of the Owner

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

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

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

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

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

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

§ 2.4 Owner's Right to Stop the Work

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

§ 2.5 Owner's Right to Carry Out the Work

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

ARTICLE 3 CONTRACTOR

§ 3.1 General

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

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

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

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

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

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

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

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

§ 3.3 Supervision and Construction Procedures

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

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

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

§ 3.4 Labor and Materials

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

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

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

§ 3.5 Warranty

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

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

§ 3.6 Taxes

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

§ 3.7 Permits, Fees, Notices and Compliance with Laws

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

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

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

§ 3.7.4 Concealed or Unknown Conditions

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

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

§ 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

.1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

.3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

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

§ 3.9 Superintendent

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

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

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

§ 3.10 Contractor's Construction and Submittal Schedules

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

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

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

§ 3.11 Documents and Samples at the Site

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

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

§ 3.12 Shop Drawings, Product Data and Samples

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

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

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

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

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

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

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

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

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

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

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

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

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

§ 3.13 Use of Site

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

§ 3.14 Cutting and Patching

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

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

§ 3.15 Cleaning Up

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

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

§ 3.16 Access to Work

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

§ 3.17 Royalties, Patents and Copyrights

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

§ 3.18 Indemnification

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

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

ARTICLE 4 ARCHITECT

§ 4.1 General

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

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

§ 4.2 Administration of the Contract

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

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

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

§ 4.2.4 Communications

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

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

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

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

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

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

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

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

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

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

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

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

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

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

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

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

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

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

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

§ 5.3 Subcontractual Relations

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

§ 5.4 Contingent Assignment of Subcontracts

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

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

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

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

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

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

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

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

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

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

§ 6.2 Mutual Responsibility

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

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

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

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

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

§ 6.3 Owner's Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

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

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

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

§ 7.2 Change Orders

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

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

§ 7.3 Construction Change Directives

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

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

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

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

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

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

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

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

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

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

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

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

§ 7.4 Minor Changes in the Work

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

ARTICLE 8 TIME

§ 8.1 Definitions

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

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

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

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

§ 8.2 Progress and Completion

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

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

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

§ 8.3 Delays and Extensions of Time

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

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

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

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

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

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

§ 9.2 Schedule of Values

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

§ 9.3 Applications for Payment

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

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

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

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

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

§ 9.4 Certificates for Payment

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

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

§ 9.5 Decisions to Withhold Certification

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

.1 defective Work not remedied;

.2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;

.3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;

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

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

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

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

§ 9.6 Progress Payments

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

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

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

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

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

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

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

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

§ 9.7 Failure of Payment

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

§ 9.8 Substantial Completion

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

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

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

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

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

§ 9.9 Partial Occupancy or Use

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

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

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

§ 9.10 Final Completion and Final Payment

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

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

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

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

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

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

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

§ 10.2 Safety of Persons and Property

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

§ 10.4 Emergencies

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

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

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

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

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

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

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

§ 11.2 Owner's Insurance

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

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

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

§ 11.3 Waivers of Subrogation

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

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

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

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

§ 11.5 Adjustment and Settlement of Insured Loss

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

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

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

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

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

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

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

§ 12.2.2 After Substantial Completion

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

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

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

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

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

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

§ 12.3 Acceptance of Nonconforming Work

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

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

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

§ 13.2 Successors and Assigns

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

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

§ 13.3 Rights and Remedies

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

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

§ 13.4 Tests and Inspections

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

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

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

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

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

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

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

§ 13.5 Interest

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

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

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

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

.4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

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

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

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

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

.1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or Suppliers;

.3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

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

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

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

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

§ 14.3 Suspension by the Owner for Convenience

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

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

.1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

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

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

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

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

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

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

§ 15.1.2 Time Limits on Claims

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

§ 15.1.3 Notice of Claims

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

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

§ 15.1.4 Continuing Contract Performance

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

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

§ 15.1.5 Claims for Additional Cost

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

§ 15.1.6 Claims for Additional Time

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

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

§ 15.1.7 Waiver of Claims for Consequential Damages

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

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

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

§ 15.2 Initial Decision

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

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

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

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

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

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

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

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

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

§ 15.3 Mediation

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

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

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

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

§ 15.4 Arbitration

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

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

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

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

§ 15.4.4 Consolidation or Joinder

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

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

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

GUIDELINES FOR RECRUITMENT AND SELECTION OF MINORITY BUSINESSES FOR PARTICIPATION IN STATE CONSTRUCTION CONTRACTS

In accordance with G.S. 143-128.2 (effective January 1, 2002) these guidelines establish goals for minority participation in single-prime bidding, separate-prime bidding, construction manager at risk, and alternative contracting methods, on State construction projects in the amount of $300,000 or more. The legislation provides that the State shall have a verifiable ten percent (10%) goal for participation by minority businesses in the total value of work for each project for which a contract or contracts are awarded. These requirements are published to accomplish that end.

SECTION A: INTENT

It is the intent of these guidelines that the State of North Carolina, as awarding authority for construction projects, and the contractors and subcontractors performing the construction contracts awarded shall cooperate and in good faith do all things legal, proper and reasonable to achieve the statutory goal of ten percent (10%) for participation by minority businesses in each construction project as mandated by GS 143-128.2. Nothing in these guidelines shall be construed to require contractors or awarding authorities 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, responsive bid or bids.

SECTION B: DEFINITIONS

1. Minority - 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;
   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;
   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;
   d. American Indian, that is, a person having origins in any of the original peoples of North America; or
   e. Female

2. Minority Business - means 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 or more minority persons or socially and economically disadvantaged individuals; and
   b. Of which the management and daily business operations are controlled by one or more of the minority persons or socially and economically disadvantaged individuals who own it.

3. Socially and economically disadvantaged individual - means the same as defined in 15 U.S.C. 637. "Socially disadvantaged individuals are those who have been subjected to racial or ethnic prejudice or cultural bias because of their identity as a member of a group without regard to their individual qualities". "Economically disadvantaged individuals are those socially disadvantaged individuals whose ability to compete in the free enterprise system has been impaired due to diminished capital and credit opportunities as compared to others in the same business area who are not socially disadvantaged".

4. Public Entity - means State and all public subdivisions and local governmental units.

5. Owner - The State of North Carolina, through the Agency/Institution named in the contract.

6. Designer – Any person, firm, partnership, or corporation, which has contracted with the State of North Carolina to perform architectural or engineering, work.

7. Bidder - Any person, firm, partnership, corporation, association, or joint venture seeking to be awarded a public contract or subcontract.

8. Contract - A mutually binding legal relationship or any modification thereof obligating the seller to furnish equipment, materials or services, including construction, and obligating the buyer to pay for them.

9. Contractor - Any person, firm, partnership, corporation, association, or joint venture which has contracted with the State of North Carolina to perform construction work or repair.

10. Subcontractor - A firm under contract with the prime contractor or construction manager at risk for supplying materials or labor and materials and/or installation. The subcontractor may or may not provide materials in his subcontract.

SECTION C: RESPONSIBILITIES

1. Office for Historically Underutilized Businesses, Department of Administration (hereinafter referred to as HUB Office).

The HUB Office has established a program, which allows interested persons or businesses qualifying as a minority business under G.S. 143-128.2, to obtain certification in the State of North Carolina procurement system. The information provided by the minority businesses will be used by the HUB Office to:

a. Identify those areas of work for which there are minority businesses, as requested.
b. Make available to interested parties a list of prospective minority business contractors and subcontractors.
c. Assist in the determination of technical assistance needed by minority business contractors.

In addition to being responsible for the certification/verification of minority businesses that want to participate in the State construction program, the HUB Office will:

(1) Maintain a current list of minority businesses. The list shall include the areas of work in which each minority business is interested.
(2) Inform minority businesses on how to identify and obtain contracting and subcontracting opportunities through the State Construction Office and other public entities.
(3) Inform minority businesses of the contracting and subcontracting process for public construction building projects.
(4) Work with the North Carolina trade and professional organizations to improve the ability of minority businesses to compete in the State construction projects.
(5) The HUB Office also oversees the minority business program by:
    a. Monitoring compliance with the program requirements.
    b. Assisting in the implementation of training and technical assistance programs.
    c. Identifying and implementing outreach efforts to increase the utilization of minority businesses.
    d. Reporting the results of minority business utilization to the Secretary of the Department of Administration, the Governor, and the General Assembly.

2. State Construction Office

The State Construction Office will be responsible for the following:

a. Furnish to the HUB Office a minimum of twenty-one days prior to the bid opening the following:
    (1) Project description and location;
    (2) Locations where bidding documents may be reviewed;
    (3) Name of a representative of the owner who can be contacted during the advertising period to advise who the prospective bidders are;
    (4) Date, time and location of the bid opening.
    (5) Date, time and location of prebid conference, if scheduled.

b. Attending scheduled prebid conference, if necessary, to clarify requirements of the general statutes regarding minority-business participation, including the bidders' responsibilities.

c. Reviewing the apparent low bidders' statutory compliance with the requirements listed in the proposal, that must be complied with, if the bid is to be considered as responsive, prior to award of contracts. The State reserves the right to reject any or all bids and to waive informalities.
d. Reviewing of minority business requirements at Preconstruction conference**.**
e. Monitoring of contractors' compliance with minority business requirements in the contract documents during construction.
f. Provide statistical data and required reports to the HUB Office.
g. Resolve any protest and disputes arising after implementation of the plan, in conjunction with the HUB Office.

3. Owner
Before awarding a contract, owner shall do the following:

a. Develop and implement a minority business participation outreach plan to identify minority businesses that can perform public building projects and to implement outreach efforts to encourage minority business participation in these projects to include education, recruitment, and interaction between minority businesses and non-minority businesses.
b. Attend the scheduled prebid conference.
c. At least 10 days prior to the scheduled day of bid opening, notify minority businesses that have requested notices from the public entity for public construction or repair work and minority businesses that otherwise indicated to the Office for Historically Underutilized Businesses an interest in the type of work being bid or the potential contracting opportunities listed in the proposal. The notification shall include the following:
    1. A description of the work for which the bid is being solicited.
    2. The date, time, and location where bids are to be submitted.
    3. The name of the individual within the owner's organization who will be available to answer questions about the project.
    4. Where bid documents may be reviewed.
    5. Any special requirements that may exist.
d. Utilize other media, as appropriate, likely to inform potential minority businesses of the bid being sought.
e. Maintain documentation of any contacts, correspondence, or conversation with minority business firms made in an attempt to meet the goals.
f. Review, jointly with the designer, all requirements of G.S. 143-128.2(c) and G.S. 143-128.2(f) – (i.e. bidders' proposals for identification of the minority businesses that will be utilized with corresponding total dollar value of the bid and affidavit listing good faith efforts, or affidavit of self-performance of work, if the contractor will perform work under contract by its own workforce) - prior to recommendation of award to the State Construction Office.
g. Evaluate documentation to determine good faith effort has been achieved for minority business utilization prior to recommendation of award to State Construction Office.
h. Review prime contractors' pay applications for compliance with minority business utilization commitments prior to payment**.**
i. Make documentation showing evidence of implementation of Owner's responsibilities available for review by State Construction Office and HUB Office, upon request

4. Designer
Under the single-prime bidding, separate prime bidding, construction manager at risk, or alternative contracting method, the designer will:

a. Attend the scheduled prebid conference to explain minority business requirements to the prospective bidders.
b. Assist the owner to identify and notify prospective minority business prime and subcontractors of potential contracting opportunities.
c. Maintain documentation of any contacts, correspondence, or conversation with minority business firms made in an attempt to meet the goals.
d. Review jointly with the owner, all requirements of G.S. 143-128.2(c) and G.S.143-128.2(f) – (i.e. bidders' proposals for identification of the minority businesses that will be utilized with

corresponding total dollar value of the bid and affidavit listing Good Faith Efforts, or affidavit of self-performance of work, if the contractor will perform work under contract by its own workforce) - prior to recommendation of award.

e. During construction phase of the project, review "MBE Documentation for Contract Payment" – (Appendix E) for compliance with minority business utilization commitments. Submit Appendix E form with monthly pay applications to the owner and forward copies to the State Construction Office.
f. Make documentation showing evidence of implementation of Designer's responsibilities available for review by State Construction Office and HUB Office, upon request.

5. Prime Contractor(s), CM at Risk, and Its First-Tier Subcontractors
Under the single-prime bidding, the separate-prime biding, construction manager at risk and alternative contracting methods, contractor(s) will:

a. Attend the scheduled prebid conference.
b. Identify or determine those work areas of a subcontract where minority businesses may have an interest in performing subcontract work.
c. At least ten (10) days prior to the scheduled day of bid opening, notify minority businesses of potential subcontracting opportunities listed in the proposal. The notification will include the following:
   (1) A description of the work for which the subbid is being solicited.
   (2) The date, time and location where subbids are to be submitted.
   (3) The name of the individual within the company who will be available to answer questions about the project.
   (4) Where bid documents may be reviewed.
   (5) Any special requirements that may exist, such as insurance, licenses, bonds and financial arrangements.

   If there are more than three (3) minority businesses in the general locality of the project who offer similar contracting or subcontracting services in the specific trade, the contractor(s) shall notify three (3), but may contact more, if the contractor(s) so desires.
d. During the bidding process, comply with the contractor(s) requirements listed in the proposal for minority participation.
e. 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 as required by G.S. 143-128.2(c) and G.S. 143-128.2(f).
f. Make documentation showing evidence of implementation of PM, CM-at-Risk and First-Tier Subcontractor responsibilities available for review by State Construction Office and HUB Office, upon request.
g. Upon being named the apparent low bidder, the Bidder shall provide one of the following: (1) an affidavit (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 applicable goal; (2) if the percentage is not equal to the applicable goal, then documentation of all good faith efforts taken to meet the goal. Failure to comply with these requirements is grounds for rejection of the bid and award to the next lowest responsible and responsive bidder.
h. The contractor(s) shall identify the name(s) of minority business subcontractor(s) and corresponding dollar amount of work on the schedule of values. The schedule of values shall be provided as required in Article 31 of the General Conditions of the Contract to facilitate payments to the subcontractors.
i. The contractor(s) shall submit with each monthly pay request(s) and final payment(s), "MBE Documentation for Contract Payment" – (Appendix E), for designer's review.
j. During the construction of a project, at any time**,** if it becomes necessary to replace a minority business subcontractor, immediately advise the owner, State Construction Office, and the Director of the HUB Office in writing**,** of the circumstances involved. The prime contractor shall make a good faith effort to replace a minority business subcontractor with another minority business subcontractor.

k. If during the construction of a project additional subcontracting opportunities become available, make a good faith effort to solicit subbids from minority businesses.
l. It is the intent of these requirements apply to all contractors performing as prime contractor and first tier subcontractor under construction manager at risk on state projects.

6. Minority Business Responsibilities
While minority businesses are not required to become certified in order to participate in the State construction projects, it is recommended that they become certified and should take advantage of the appropriate technical assistance that is made available. In addition, minority businesses who are contacted by owners or bidders must respond promptly whether or not they wish to submit a bid.

SECTION 4: DISPUTE PROCEDURES
It is the policy of this state that disputes that involves a person's rights, duties or privileges, should be settled through informal procedures. To that end, minority business disputes arising under these guidelines should be resolved as governed under G.S. 143-128(g).

SECTION 5: These guidelines shall apply upon promulgation on state construction projects. Copies of these guidelines may be obtained from the Department of Administration, State Construction Office, (physical address) 301 North Wilmington Street, Suite 450, NC Education Building, Raleigh, North Carolina, 27601-2827, (mail address) 1307 Mail Service Center, Raleigh, North Carolina, 27699-1307, phone (919) 807-4100, Website: www.nc-sco.com

SECTION 6: In addition to these guidelines, there will be issued with each construction bid package provisions for contractual compliance providing minority business participation in the state construction program.

MINORITY BUSINESS CONTRACT PROVISIONS (CONSTRUCTION)

APPLICATION:

The **Guidelines for Recruitment and Selection of Minority Businesses for Participation in State Construction Contracts** are hereby made a part of these contract documents. These guidelines shall apply to all contractors regardless of ownership. Copies of these guidelines may be obtained from the Department of Administration, State Construction Office, (physical address) 301 North Wilmington Street, Suite 450, NC Education Building, Raleigh, North Carolina, 27601-2827, (mail address) 1307 Mail Service Center, Raleigh, North Carolina, 27699-1307, phone (919) 807-4100, Website: http://www.nc-sco.com

MINORITY BUSINESS SUBCONTRACT GOALS:

The goals for participation by minority firms as subcontractors on this project have been set at 10%.

The bidder must identify on its bid, the minority businesses that will be utilized on the project with corresponding total dollar value of the bid and affidavit (Affidavit A) listing good faith efforts **or** affidavit (Affidavit B) of self-performance of work, if the bidder will perform work under contract by its own workforce, as required by G.S. 143-128.2(c) and G.S. 143-128.2(f).

The lowest responsible, responsive bidder must provide 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 applicable goal.

OR

Provide Affidavit D, that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, **with documentation of Good Faith Effort, if the percentage is not equal to the applicable goal.**

OR

Provide Affidavit B, which includes sufficient information for the State to determine that the bidder does not customarily subcontract work on this type project.

The above information must be provided as required. Failure to submit these documents is grounds for rejection of the bid.

MINIMUM COMPLIANCE REQUIREMENTS:

All written statements, affidavits or intentions made by the Bidder shall become a part of the agreement between the Contractor and the State for performance of this contract. Failure to comply with any of these statements, affidavits or intentions, or with the minority business Guidelines shall constitute a breach of the contract. A finding by the State that any information submitted either prior to award of the contract or during the performance of the contract is inaccurate, false or incomplete, shall also constitute a breach of the contract. Any such breach may result in termination of the contract in accordance with the termination provisions contained in the contract. It shall be solely at the option of the State whether to terminate the contract for breach.

In determining whether a contractor has made Good Faith Efforts, the State will evaluate all efforts made by the Contractor and will determine compliance in regard to quantity, intensity, and results of these efforts. Good Faith Efforts include:

(1) Contacting minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor or available on State or local government maintained lists at least 10 days before the bid or proposal date and notifying them of the nature and scope of the work to be performed.

(2) Making the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bid or proposals are due.

(3) Breaking down or combining elements of work into economically feasible units to facilitate minority participation.

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

(5) Attending any prebid meetings scheduled by the public owner.

(6) Providing assistance in getting required bonding or insurance or providing alternatives to bonding or insurance for subcontractors.

(7) Negotiating in good faith with interested minority businesses and not rejecting 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) Providing 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. Assisting minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.

(9) Negotiating 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) Providing quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

APPENDIX E

MBE DOCUMENTATION FOR CONTRACT PAYMENTS

Prime Contractor/Architect: _____

Address & Phone: _____

Project Name: _____

Pay Application #: _____ Period: _____

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

MBE FIRM NAME	* INDICATE TYPE OF MBE	AMOUNT PAID THIS MONTH	TOTAL PAYMENTS TO DATE	TOTAL AMOUNT COMMITTED

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

Date: _____ Approved/Certified By: _____
Name

_____
Title

_____
Signature

SUBMIT WITH EACH PAY REQUEST & FINAL PAYMENT

(Revised on 3/14/2003)

DIVISION 00

SECTION 00 91 13: SUPPLEMENTAL SHEETS

Stump Sound Elementary School – New School
Holly Ridge, North Carolina

00 91 13.01: GENERAL

1. These supplemental sheets are a part of the Specifications and are intended to give additional information on items which may or may not be noted in the specifications or on the drawings. It is suggested that the Contractor carefully read these sheets and note changes, additions, etc., in the corresponding section of these specifications.

2. The specifications are typical and only those parts applicable to this project will be considered.

00 91 13.02: MODIFICATION

RESERVED FOR FUTURE MODIFICATIONS

00 91 13.03: ADDITIONAL SPECIFICATION

RESERVED FOR FUTURE SPECIFICATIONS

00 91 13.04: DRAWINGS

RESERVED FOR FUTURE MODIFICATIONS AND CLARIFICATIONS PER ADDENDUM

00 91 13.05: PRIOR APPROVAL

RESERVED FOR FUTURE MODIFICATIONS AND CLARIFICATIONS PER ADDENDUM

DIVISION 01

SECTION 01 10 00: PROJECT SUMMARY

Stump Sound Elementary School – New School
Holly Ridge, North Carolina

01 10 00.01: GENERAL

A. SCOPE

1. The Project consists of the construction of a new elementary school, approximately one hundred nine thousand (109,000) square feet. The school will house an administration wing, classroom wings, gymnasium, media center and cafeteria with a full-service kitchen. The building will be conditioned by a combination of split system air conditioning and vertical exterior heat pump; electrical service will be 277/480V & 120/208v with an emergency (LP gas powered) generator. The building will be fully sprinklered. This project includes Alternates of additional classrooms, Owner preferred items and a diesel-powered generator (see Section 01 23 00).

B. BIDDING

1. Bidding will be by invitation and/or by pre-approved licensed contractors by the Owner through the Architect. Contractor should have five (5) years of construction experience with at least three (3) similar projects to his credit (with favorable recommendations). Contractor must submit AIA Qualification Form A305 to the Architect before applying for Construction Bid Documents.
2. All Contractors must visit the site and by submitting a bid has satisfied himself that he understands the scope of the work.
3. The bidding is "turn key" and includes all permitting, equipment, scaffolding and clean up (disposing) to present a complete project ready to use by the Owner.

C. LOCATION

1. The Project is located at Folkstone Road, Holly Ridge, NC 28445.

01 10 00.02: DRAWINGS

A. SCHEDULE OF DRAWINGS:

1. The following drawing sheets amplify/illustrate and compliment these specifications and together will be considered as one document.

General Construction:

Sheet A100	- Cover Sheet
Sheets A101 thru A108	- General
Sheets C100 thru C115	- Civil Drawings
Sheets A200 thru A702	- Architectural Drawings
Sheets S100 thru S210	- Structural Drawings
Sheets FP100 thru FP101	- Fire Protection Drawings
Sheets P100 thru P302	- Plumbing Drawings
Sheets M100 thru M300	- Mechanical Drawings
Sheets E100 thru E701	- Electrical Drawings

DIVISION 01

SECTION 01 21 00: ALLOWANCES

Stump Sound Elementary School – New School
Holly Ridge, North Carolina

01 21 00.01: GENERAL

A. REQUIREMENTS INCLUDED

1. Designate in the Construction Schedule the delivery and installation dates for Materials covered by allowance.

2. Designate in the Schedule of Values quantities of materials covered by allowance.

B. SCOPE

1. The following cash allowance shall be included in the Contract Price. If the Actual cost is more than or less than the allowance, the Contract Price will be adjusted up or down accordingly when the actual cost is determined. Adjustments in the Contract Price will be made by Change Order. The amount below includes the net cost of materials and shipping charges to the Project Site.

2. The Contractor's overhead and profit shall be included in the Contract Price, but Not in the allowance. Any taxes shall be included in the Contract Price, but not in the allowance. The cost of labor for installation shall be included in the Contract Price, but not in the allowance. The contractor shall submit to the Architect/ Engineer for approval all bills for materials under Cash Allowances.

3. Where applicable, the Architect/Engineer will make the selections of materials Covered by the allowance.

C. SCHEDULE OF ALLOWANCES

1. Lump Sum Allowance

a.	General Allowance (to include labor within the allowance. Cost of labor will be as stipulated per Trade in the most recent Davis-Bacon Act.)	$ 100,000.00
b.	Brick Allowance	$ 1,000.00/Thousand Brick
c.	NCDOT Upgrades-US HWY 17	$250,000.00
d.	Systems Allowance (as shown below)	$395,000.00

1) Lockdown System
2) Paging Intercom System
3) Video Intercom System
4) I/P Camera System
5) Card Access Control System
6) Intrusion Detection System
7) Dining/Gym Sound System
8) Bi-Directional Amplification System (Emergency Responder Radio)
9) UPS for Main IT Room

2. Quantity Allowance

a.	Unsuitable Soil - Disposed of Offsite	20,000 Cubic Yards
b.	Engineered Soil - Offsite borrow fill	20,000 Cubic Yards

DIVISION 01

SECTION 01 22 00: UNIT PRICES

Stump Sound Elementary School – New School
Holly Ridge, North Carolina

01 22 00.01: GENERAL

A. SCOPE

1. The Contractor shall state on his Proposal the amounts to be added for each of the unit prices specified herein. Each unit price shall cover all costs, by trades, required for that particular part of the work completed, in place and ready for use by the Owner. All Bonds, insurance, overhead and profit, etc. to be included per unit specified.

2. A unit price unaddressed will be considered as "no change" in contract price.

3. The Owner reserves the right to issue a change order for any quantity of any unit at any time during the course of contract and amend the Contract accordingly. Price will be figured by simply multiplying unit price by quantity necessary.

4. Unit prices will also be used to deduct materials from the Contract including base bid and alternates. Amount of deduction will be quantity by cost per unit.

5. All unit prices including any unit price not specifically mentioned herein shall be in accordance with all sections of specifications governing those items - including SECTIONS 00 21 13, 00 72 00, 00 73 00 and 00 91 13.

01 22 00.02: UNIT PRICES

A. CERAMIC/PORCELAIN TILE (per square foot)

Per SECTION 09 30 13

B. QUARRY TILE (per square foot)

Per SECTION 09 30 16

C. SUSPENDED ACOUSTICAL CEILING (per square foot)

Per SECTION 09 51 00

D. RESILIENT FLOORING (VCT) (per square foot)

Per SECTION 09 65 00

E. RESILIENT SPORTS FLOORING (per square foot)

Per SECTION 09 65 66

F. EPOXY TERRAZZO (per square foot)

Per SECTION 09 66 23.16

G. CARPET TILES (per square foot)

Per SECTION 09 68 13

H. PAINTING (per square foot)

Per SECTION 09 90 00

I. DIRT EXCAVATION (per cubic yard)

Per SECTION 31 20 00

J. COMPACTED FILL (per cubic yard)

Per SECTION 31 20 00, 31 23 00 and any other pertinent Sections of these specifications.

K. UNSUITABLE SOIL - DISPOSED OF OFF-SITE (per cubic yard)

Per SECTION 31 23 00

L. OFF-SITE BORROW FILL - ENGINEERED, COMPACTED IN PLACE (per cubic yard)

Per SECTION 31 23 00

M. ROCK EXCAVATION, MASS ROCK DRILLING AND BLASTING (per cubic yard)

Per SECTION 31 20 00, 31 23 16.26 and any other pertinent Sections of these specifications.

N. ROCK EXCAVATION, TRENCH ROCK DRILLING AND BLASTING (per cubic yard)

Per SECTION 31 20 00, 31 23 16.26 and any other pertinent Sections of these specifications.

O. FORMED CAST IN PLACE REINFORCED CONCRETE (per cubic yard)

Per SECTIONS 31 23 16.26, 31 22 19, 31 31 16, 32 13 00, 03 10 00, 03 20 00, 03 30 00, and any other pertinent Sections of these specifications. Concrete work may include sidewalks, floor slabs, roof decks, grade beams, columns, etc.

P. HEAVY-DUTY ASPHALT PAVING (per square foot)

Per SECTION 32 12 16, and any other pertinent Sections of these specifications.

Q. LIGHT-DUTY ASPHALT PAVING (per square foot)

Per SECTIONS 32 12 16, and any other pertinent Sections of these specifications.

DIVISION 01

SECTION 01 23 00: SUMMARY OF ALTERNATES

Stump Sound Elementary School – New School
Holly Ridge, North Carolina

01 23 00.01: GENERAL

A. SCOPE

1. The Contractor shall state on his Proposal the amounts to be added/subtracted to the Base Bid for each of the Alternates specified herein. Each Alternate price shall cover all sub contract, material, overhead, profit and taxes required to complete that particular part of the work in place and ready for use by the Owner.

2. An Alternate price unaddressed, (i.e. left blank) will be considered as "no change" in price.

3. The Owner reserves the right to accept any Alternate and amend the Contract accordingly within sixty days of the signing of the construction contract without change in the Alternate price as bid.

4. Shop drawings and submittals will be required before acceptance for each alternate.

01 23 00.02: ALTERNATES

A. Alternate #1: Six (6) Classroom Addition

This alternate is to provide six (2) additional classrooms; two (2) at each wing for a total of approximately 7,600 SF as shown in the Construction Documents. Refer to Sheets A700 & A701.

B. Alternate #2: Owner Preferred Finish Hardware

This alternate is to provide the following Owner Preferred Finish Hardware:

1. Locks - Schlage
2. Exit Devices - Von Duprin
3. Closers - LCN

as shown in the Construction Documents. Refer to Specification Section 08 71 00.

C. Alternate #3: Owner Preferred Equipment

This alternate is to provide the following Owner Preferred equipment:

1. Fire Alarm - Notifier
   a. As shown in Specification Section 28 31 12.
2. Gear/Panels/Disconnects/Contactors - Square D
   a. As shown in Specification Sections 26 00 00-Electrical Alternates, 26 09 23-Contactors, 26 24 13-Switchboard, 26 24 16-Panelboards, 26 28 16-Disconnects, 26 51 00 Contactors.

D. Alternate #4: Generator (Emergency Shelter situation)

This alternate is to provide a diesel generator with sub-base tank for kitchen, dining and multipurpose rooms to provide power to school in the event that the school becomes an emergency shelter. This generator, if chosen will replace the generator provided in the base bid and shall be as shown in the Construction Documents. Refer to Specification Sections 26 32 01.02 and 26 36 01.02. Refer to Sheets E304 and E601.

DIVISION 01

SECTION 01 25 00: SUBSTITUTION PROCEDURES

01 25 00.01: GENERAL

A. RELATED DOCUMENTS

1. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. SUMMARY

1. This Section specifies administrative and procedural requirements for handling requests for substitutions made after award of the Contract.

2. The Contractor's Construction Schedule and the Schedule of Submittals are included under Section "Submittals."

3. Standards: Refer to Section "Definitions and Standards" for applicability of industry standards to products specified.

4. Procedural requirements governing the Contractor's selection of products and product options are included under Section "Materials and Equipment."

C. DEFINITIONS

1. Definitions used in this Article are not intended to change or modify the meaning of other terms used in the Contract Documents.

2. Substitutions: Requests for changes in products, materials, equipment, and methods of construction required by Contract Documents proposed by the Contractor after award of the Contract are considered requests for "substitutions." The following are not considered substitutions:

    a. Substitutions requested by Bidders during the bidding period, and accepted prior to award of Contract, are considered as included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.
    b. Revisions to Contract Documents requested by the Owner or **PINNACLE ARCHITECTURE, P.A.**
    c. Specified options of products and construction methods included in Contract Documents.
    d. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

D. SUBMITTALS

1. Substitution Request Submittal: Requests for substitution will be considered if received within thirty (30) days after commencement of the Work. Requests received more than thirty (30) days after commencement of the Work may be considered or rejected at the discretion of **PINNACLE ARCHITECTURE, P.A.**

   a. Submit three (3) copies of each request for substitution for consideration. Submit requests in the form and in accordance with procedures required for Change Order proposals.

   b. Identify the product, or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:

      1) Product Data, including Drawings and descriptions of products, fabrication and installation procedures.
      2) A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect.
      3) Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate Contractors, that will become necessary to accommodate the proposed substitution.
      4) A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
      5) Cost information, including a proposal of the net change, if any in the Contract Sum.
      6) Certification by the Contractor that the substitution proposed is equal-to or better in every significant respect to that required by the Contract Documents, and that it will perform adequately in the application indicated. Include the Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.

   c. **PINNACLE ARCHITECTURE, P.A.**'s Action: Within one week of receipt of the request for substitution, **PINNACLE ARCHITECTURE, P.A.** will request additional information or documentation necessary for evaluation of the request. Within two (2) weeks of receipt of the request, or one week of receipt of the additional information or documentation, whichever is later, **PINNACLE ARCHITECTURE, P.A.** will notify the Contractor of acceptance or rejection of the proposed substitution. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, use the product specified by name. Acceptance will be in the form of a Change Order.

01 25 00.02: PRODUCTS

A. SUBSTITUTIONS

1. Conditions: The Contractor's substitution request will be received and considered by **PINNACLE ARCHITECTURE, P.A.** when one or more of the following conditions are satisfied, as determined by **PINNACLE ARCHITECTURE, P.A.;** otherwise requests will be returned without action except to record noncompliance with these requirements.

    a. Extensive revisions to Contract Documents are not required.
    b. Proposed changes are in keeping with the general intent of Contract Documents.
    c. The request is timely, fully documented and properly submitted.
    d. The request is directly related to an "or equal" clause or similar language in the Contract Documents.
    e. The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.
    f. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
    g. A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to **PINNACLE ARCHITECTURE, P.A.** for redesign and evaluation services, increased cost of other construction by the Owner or separate Contractors, and similar considerations.
    h. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the substitution will overcome the incompatibility.
    i. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution can be coordinated.
    j. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provide the required warranty.

2. The Contractor's submittal and **PINNACLE ARCHITECTURE, P.A.**'s acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contract Documents does not constitute an acceptable or valid request for substitution, nor does it constitute approval.

DIVISION 01

SECTION 01 26 13: REQUEST FOR INFORMATION

Date:_____

Stump Sound Elementary School – New School
Folkstone Road
Holly Ridge, North Carolina

To: Pinnacle Architecture, P.A.
P.O. Box 187 (630 Team Rd. Ste 200)
Matthews, NC 28106 (28105)
stacey@pinnaclearchitecture.net
melissa@pinnaclearchitecture.net
Fax: 704-847-9853

RFI Number: _____

In reference to the above listed project, we are hereby requesting a clarification, determination and/or information concerning the following:

Section Number:_____ Drawing Number:_____

_____

_____

_____

_____

_____

_____

Requested By: _____Date of Request:_____

Title:_____Date Reply Required:_____

Company:_____

In reply to your request, be advised:_____

_____

_____

_____

_____

Reply By:_____ Date of Reply: _____

Title:_____ Date Reply Returned: _____

DIVISION 01

SECTION 01 31 19: PROJECT MEETINGS

01 31 19.01: GENERAL

A. RELATED DOCUMENTS

1. The work of this section shall be included as a part of the Contract Documents of each Contractor on this Project. Where such work applies to only one Contractor, it shall be defined as to which Contractor the work belongs.

B. SUMMARY

1. Each Contractor or awardee shall be required to have present at each of the following project meetings a representative acceptable to the Architect. The designated representative shall have sufficient authority and knowledge to make decisions for the Contractor he is representing on matters affecting this Project.

2. A Contractor or representative unable to attend a specified meeting shall have an acceptable alternate representative designated or shall notify the Architect not less than seven (7) days prior to date of meeting.

3. Pre-Construction Meeting:

   a. The purpose of this meeting is to review submittals that will be required by the Contractors and to review the project procedures that are to be followed during the progress of construction.
   b. Advance written notice of the Pre-Construction Conference date, time, and place will be sent to the various successful Bidders by the Architect. Each Prime Contractor shall require his principal subcontractors to attend.
   c. Minimum agenda shall be as follows:

      1) Discussion of construction.
      2) Critical work sequencing.
      3) Designation of responsible personnel.
      4) Processing of field decisions and change orders.
      5) Distribution of Contract Documents.
      6) Submittal of shop drawings, product data and samples.
      7) Procedures for maintaining record documents.
      8) Use of premises:

         a) Office and storage areas.
         b) Owner's requirements.

      9) Major equipment deliveries and priorities.
      10) Safety and first-aid procedures.
      11) Security procedures.
      12) Housekeeping procedures.
      13) Review of code compliance requirements (with code officials present and available for questions).

4. Progress Meetings:

   a. Progress meetings will be established on an as needed basis, (by the Architect Construction Administration Representative), to review the progress of construction, possible delays, problems, and projected construction activity. Attendance at the progress meeting is required by all Contractors on site, as well as by Contractors preparing to move on site.

      1) Notice of said meetings will originate in the office of the General Contractor.
      2) Each Contractor shall require his principal subcontractors to attend.
      3) These meetings shall be attended by Contractors with work in progress or with work about to commence. The progress and schedule of each involved Contractor shall be coordinated at this meeting. The representatives of the Contractor present shall have the authority to change the Contractor's work schedule or authorize work with the consent of the Contractor. If the Contractor fails to attend this meeting, it shall be his responsibility to obtain the information discussed at the meeting. Meeting notes and the most current schedule will be in the office of the General Contractor.
      4) Minimum agenda shall be as follows:

         a) Review work progress since last meeting.
         b) Note field observations, problems, and decisions.
         c) Identify problems which impede planned progress.
         d) Review off-site fabrication problems.
         e) Develop corrective measure and procedures to regain planned schedule.
         f) Revise construction schedule as indicated.
         g) Plan progress during next work period.
         h) Review submittal schedules, expedite as required to maintain schedule.
         i) Maintaining of quality and work standards.
         j) Review changes proposed by Owner for effect on construction schedule and effect on completion schedule.
         k) Complete other current business.

5. Contractors shall review and comply with required pre-installation conferences outlined in the Contract Documents. (See individual specification sections.)

DIVISION 01

SECTION 01 32 16: SCHEDULES AND REPORTS

01 32 16.01: GENERAL

A. SCOPE

1. The Contractor shall submit to the Architect such schedule of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data as the Owner may request concerning work performed under this contract.

B. CONSTRUCTION SCHEDULE

1. Within ten (10) days after execution and delivery of the contract, the Contractor shall deliver to the Architect an estimated construction progress schedule in a form satisfactory to the Owner, showing the proposed dates of commencement and completion of each of the various subdivisions of work required under the contract documents and the anticipated amount of each monthly payment that will become due to the Contractor in accordance with the progress schedule.

C. SCHEDULE OF VALUES

1. Within ten (10) days after execution and delivery of the contract, the Contractor shall furnish a detailed schedule of values giving a complete breakdown of the contract price. The values scheduled will be used only for determining the basis of partial payments and will not be considered as fixing a basis for additions to or deductions from the contract price.

D. MATERIALS LIST

1. Within ten (10) days after execution and delivery of the contract, the Contractor shall submit, for approval and record, complete lists or schedules of all materials suppliers, and of all proposed construction materials and equipment.

2. Brand names where used in the technical specifications, are intended to denote the standard of quality required for the particular material or product. The term equal or equivalent, when used in connection with brand names, shall be interpreted to mean a material or product that is similar and equal in type, quality, size, capacity, composition, finish, color and other applicable characteristics to the material or product specified by trade name, and that, in the opinion of the Architect, is suitable for the same use and capable of performing the same function as the material or product specified.

3. Each Contractor shall obtain approval from the Architect for use of materials not mentioned as standard. Such approvals must be obtained as soon after contract award as possible and before any materials are ordered. Applications for approvals shall be made by the Contractor and not the Subcontractor or material suppliers. When this list is approved, no substitutions will be permitted except in unusual or extenuating circumstances. If no list is submitted, it will be assumed that the Contractor will supply materials specified and the Contractor shall be held to this requirement.

E. LIST OF SUBCONTRACTORS

1. Within ten (10) days after execution and delivery of the contract, the Contractor shall submit, for approval and record, the names of the Subcontractors proposed for each of the principal parts of the work. The Architect, after due investigation, will notify the Contractor of any reasonable objection to any such proposed Subcontractor.

F. RECORD DRAWINGS

1. The Contractor shall maintain notes of any changes or modifications. Upon completion of project, the Contractor shall note such changes on plans and deliver the plans to the Architect, with final certificates. Final payment will not be made by the Owner until these drawings are in the hands of the Owner.

G. REPORTS, RECORDS AND DATA

1. The Contractor shall submit to the Owner such schedule of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data as the Owner may request concerning work performed or to be performed under this contract.

DIVISION 01

SECTION 01 33 00: SHOP DRAWINGS AND SUBMITTALS

01 33 00.01: GENERAL

A. SCOPE

1. The reviewing of shop drawings and submittals is to be regarded as assisting the Contractor, and in reviewing same, the Architect does not relieve the Contractor from the responsibility for errors or omissions which may exist even though in accordance with the approved drawings. Should errors or omissions be discovered at a later date, they must be made good by the contractor, irrespective of any approval of the Architect. Manufacturer's or fabricator's shop drawings shall be submitted to the General Contractor and before the General Contractor, or his Subcontractors, submits shop drawings to the Architect for approval, he shall:

    a. Submit shop drawings, product data and samples where called for by these specifications.
    b. Shop, erection and setting drawings, certificates, catalog cuts, and schedules required for work of various trades, shall be checked before submission, as hereinafter specified, by technically qualified employees of Contractor for accuracy, completeness and compliance with contract requirements. All submittals must be stamped and signed by the Contractor certifying to such check and must be accompanied by a letter of transmittal signed by Contractor.
    c. When requested by the Architect, the Contractor shall submit shop drawings, erection or setting drawings, and schedules of various items of work, whether or not such drawings or schedules are specifically mentioned in the technical sections of the specifications.
    d. No items shall be fabricated, nor any portion thereof shipped to site prior to approval of applicable shop drawings.
    e. The Contractor is responsible for any delay caused by his failure to observe these requirements, and the time for the completion of his contract will not be extended because of such delays.

01 33 00.02: SUBMISSION PROCEDURE

A. IN ORDER THAT THE ARCHITECT MAY EXPEDITE THE APPROVAL AND RETURN OF THE SHOP DRAWINGS, ALL MUST BE SUBMITTED AS FOLLOWS:

1. Shop drawings of materials shown on coded sections, details, etc., must bear the same section and code identification as noted on the Architectural drawings.

2. For each drawing/document required, submit four (4) copies not exceeding 24" x 36" in size.

3. Each drawing shall have marked thereon proper descriptive title, manufacturer's project and sheet number, name of project for which submitted and exact location where material covered by such drawings is to be used.

4. A space 5" x 5" shall be reserved on each drawing to accommodate Architectural stamp.

5. Each submittal must be properly stamped, dated and signed by the Contractor verifying that same has been completely checked for accuracy, completeness and compliance with contract requirements.

6. The submittals will be reviewed by the Architect and returned to the General Contractor for corrections. Any delays resulting from compliance with this directive shall be the responsibility of the Contractor. Regardless of corrections made to such drawings by the Architect, the Contractor will nevertheless be responsible for the accuracy of such drawings and their conformance to the Plans and Specifications unless he gives notice in writing of any deviations at the time such drawings are furnished.

7. Shop drawings are reviewed by the Architect for compliance with the design concept of the project and compliance with the information given in the contract documents. The Contractor is responsible for dimensions to be confirmed and correlated at the site; for information that pertains solely to the fabrication processes or to the means, methods, techniques, sequences, and procedures of construction; and for coordination of the work of all trades. The Architect's review of a specific item does not indicate approval of an assembly of which the item is a component.

8. Drawings returned to the Contractor with the Architect's "No Exception Taken", "Make Corrections Noted" or "Exceptions Indicated" stamp need not be resubmitted for approval, however any notes or corrections indicated by the Architect on the "Make Corrections Noted" or "Exceptions Indicated" copies of shop drawings shall be complied with in the selections, fabrications, and installation. Corrected copies of "Make Corrections Noted" or "Exceptions Indicated" shop drawings shall be furnished for record when requested.

9. If submittals are stamped "Revise and Resubmit" or "Rejected - See Remarks", the corrections shall be made and new documents shall be submitted to the Architect for approval.

10. Each Contractor shall maintain, in readable condition at his job office, one complete set of working drawings and specifications of his work including all shop drawings bearing the appropriate Architect's stamp. Such drawings and specifications shall be available for use by the Architect.

B. CERTIFICATES SCHEDULES AND CATALOG CUTS (MANUFACTURER'S DATA)

1. Certificates, schedules and catalog cuts shall be submitted in quadruplicate (4). When catalog cuts are submitted, the specific item to be considered shall be identified as specified above. Items that are not so identified will be returned to the Contractor without action.

C. SAMPLES

1. Samples shall be submitted as called for in the technical sections of these specifications. Each sample shall be identified with descriptive title, manufacturer's name, name of project for which submitted, and location where material is to be used.

2. Samples shall be in triplicate (3), one (1) to be retained by the Architect and two (2) to be returned to the Subcontractor, one (1) of which is to be placed on file in the field office for comparison to the products delivered. Where full-size samples are required and specified to be installed on the Project, only one (1) sample will be required.

DIVISION 01

SECTION 01 50 00: TEMPORARY FACILITIES

01 50 00.01: GENERAL

A. SCOPE

1. Provide all temporary structures and utilities required for proper execution of the work including, but not limited to, those items specified herein.

01 50 00.02: TEMPORARY FACILITIES

A. TEMPORARY STRUCTURES

1. The General Contractor shall erect a temporary field office, complete with lights, telephone (installed at the Contractor's expense) and heat (in cold weather.)

2. Each contractor shall provide all necessary storage sheds, shanties, etc. of adequate size, for his own use. All temporary structures shall be built in a sound waterproof manner and shall remain on the premises until their removal is directed by the Architect.

B. TEMPORARY TOILETS

1. The General Contractor shall provide toilet facilities for all employees, as required by local ordinances, for complete adequate sanitary arrangements. These facilities shall be kept neat and clean at all times and shall be available to other contractors at all times.

C. TEMPORARY UTILITIES

1. The General Contractor shall provide water required by all trades for building purposes.

2. The General Contractor shall negotiate with the local electric utility for all necessary power requirements for construction purposes on the basis of applicable construction power rate schedules. Any expenses in securing electrical service and cost of the electrical energy usages for construction purposes shall be borne by the Contractor. Other contractors who have special electrical needs will make satisfactory arrangements with the General Contractor for same. In the event that special power requirements are necessary during the construction stages, the Contractor shall be responsible for the provisions thereof, with full co-operation and coordination of the Architect and other contractor(s) involved in order to meet the requirements of the approved plans and specifications. The Contractor's responsibility for electric service ceases upon the issuance of the "Certificate of Occupancy" or acceptance by Owner. At this time, notice should be given the local electric utility for Contractor's construction service "disconnect" and Owner's service "connect".

3. The General Contractor shall provide necessary heat as required before the building is closed or as directed by the Architect. The Contractor shall close all exterior openings, and keep same closed, until permanent enclosures are in place and while the building is being heated. Temporary heat shall be kept in operation as required, or as directed by the Architect. Other contractors with special needs will make arrangements with the General Contractor for same, but in no case will the General Contractor be relieved of the above requirement.

4. If the building's permanent mechanical systems are used for temporary heating or cooling during construction, the General Contractor shall pay for the fuel consumed. Under such circumstances the Contractor must provide temporary filters for all air handling equipment.

5. If the Contractor elects to use the mechanical systems for his own purposes (comfort, dry-out building, etc.) the Architect, or his engineer representative, shall conduct an inspection of the system prior to its being started. The Manufacturer's guarantee period begins from the day the equipment is started. The General Contractor will be responsible for the additional guarantee period needed to total 12 months to the Owner following the date of Substantial Completion.

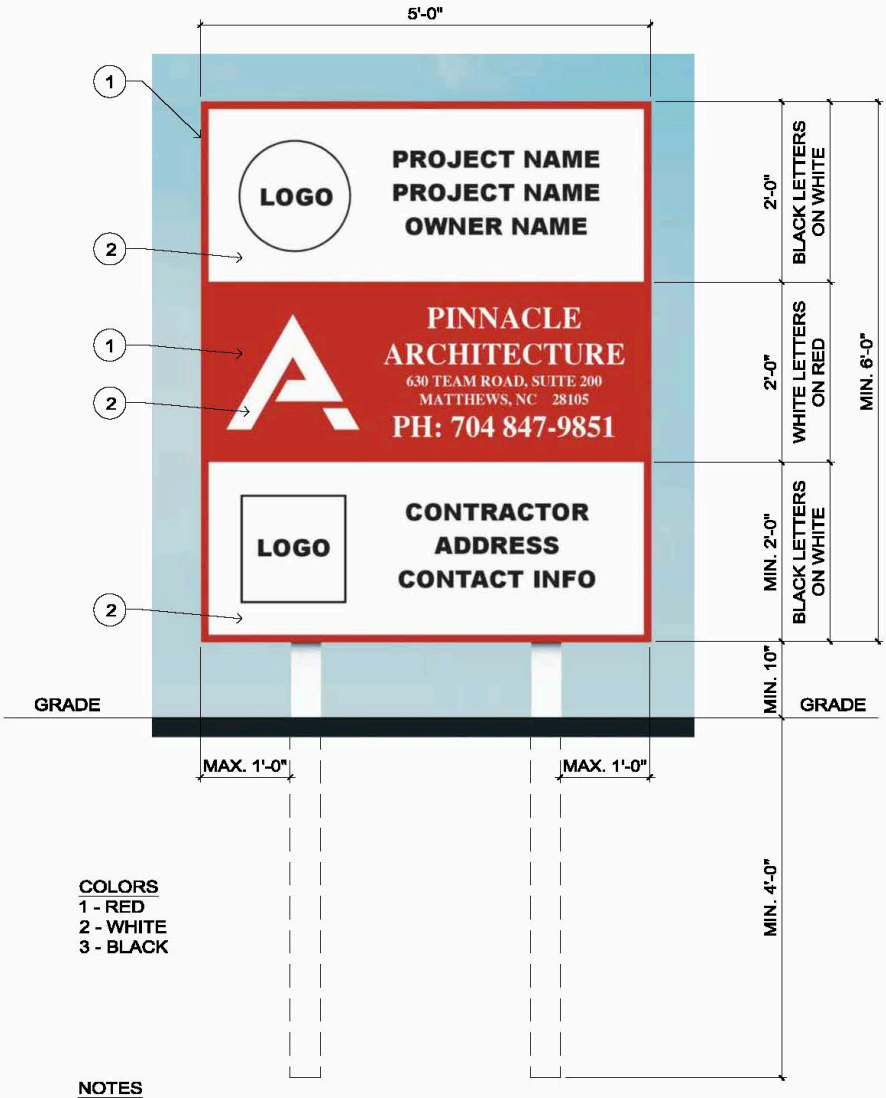
6. If the Owner elects to use the mechanical systems for his own purposes (install lockers, equipment, etc.) prior to the date of Substantial Completion, then the Owner's 12-month guarantee period will begin on the day he begins using the facility. The Architect is to be notified and an inspection made prior to starting the mechanical systems.

7. The contractor shall, at all times, keep the premises free from accumulation of waste material or rubbish caused by his work or employees, and, at the completion of his work, he shall remove all debris and all his tools, scaffolding, and surplus material from the premises.

8. Do all shoring and build all barricades and temporary partitions necessary to protect the public and present property from all damage, danger and weather.

DIVISION 01

SECTION 01 58 13: PROJECT SIGN



COLORS
1 - RED
2 - WHITE
3 - BLACK

NOTES
A) CONTRACTOR TO ERECT SIGN AS ILLUSTRATED HEREON.
B) GENERAL CONTRACTOR OPTION TO INCLUDE SUB-CONTRACTORS.
C) OWNER AND CONTRACTOR LOGOS TO BE FULL COLOR.

GENERAL NOTES
1) ALL PROJECT(S) SHALL HAVE A MINIMUM OF (1) ONE SIGN.
2) SIGN LOCATION(S) TO BE DETERMINED BY ARCHITECT DURING THE PRE-CONSTRUCTION MEETING.
3) PROJECT SIGN(S) MUST BE ERECTED BEFORE THE FIRST PAY REQUEST WILL BE CONSIDERED.

ARCHITECT ADDRESS NOTE
CONSULT ARCHITECT FOR CORRECT OFFICE ADDRESS AND FONT STYLE:

MATTHEWS, NC ADDRESS:

PINNACLE
ARCHITECTURE
630 TEAM ROAD, SUITE 200
MATTHEWS, NC 28105
PH: 704 847-9851

CHARLESTON, SC ADDRESS

PINNACLE
ARCHITECTURE
701 EAST BAY STREET, SUITE 302
CHARLESTON, SC 29403
PH: 843 872-5345

DIVISION 01

SECTION 01 60 00: PRODUCT REQUIREMENTS

01 60 00.01: GENERAL

A. SUMMARY

1. Work included:

   a. Protect products scheduled for use in the work.
   b. Product options and substitutions.
   c. Each Subcontractor is responsible for receipt, storage, protection and on-site movement of their products and equipment.

2. Related work:

   a. Section 01 33 00: Submittal Procedures (shop drawings, product data and samples).
   b. Additional procedures may be prescribed in other Sections of these Specifications.

B. MANUFACTURERS RECOMMENDATIONS

1. Comply with manufacturers' recommendations on product handling, storage and protection.

C. PACKAGING

1. Deliver products to the job site in their manufacturer's original container, with labels intact and legible.

D. STORAGE

1. Generally, elevate all materials from the ground.

2. Store all products likely to be stolen in a locked area.

3. Store all products susceptible to weathering, mold, decay, ultra violet or other form of deterioration, in a protected and humidity controlled environment.

E. PROTECTION

1. Protect finished surfaces, including jambs and soffits of openings used as passageways, through which equipment and materials are handled.

2. Provide protection for finished floor surfaces in traffic areas prior to allowing equipment or materials to be moved over such surfaces.

3. Maintain furnished surfaces cleaned, unmarred and suitably protected until accepted by the Owner.

F. REPAIRS AND REPLACEMENTS

1. In the event of damage, promptly make replacements and repairs to the approval of the Architect and at no additional cost to the Owner.

2. Additional time required to secure replacements and to make repairs will not be considered by the Architect to justify an extension in the Contract Time of Completion.

G. PRODUCT OPTIONS AND SUBSTITUTIONS

1. Various components in these Specifications are part of assemblies used to conform to requirements of Fire and Life Safety, A.D.A., State Energy Code, IBC and other similar regulations. These assemblies may or may not involve proprietary products. Substitution of one component of an assembly could invalidate the approval of the assembly and must, therefore, be carefully considered.

2. The following products do not require further approval except for interface within the Work:

   a. Products specified by reference to standard specifications such as ASTM and similar standards.
   b. Products specified by manufacturer's name and catalog model number.
   c. Do not substitute materials, equipment or methods unless such substitution has been specifically approved by the Architect.

3. "Or equal":

   a. Where the phrase "or equal", or "or equal as approved by the Architect", occurs in the Contract Documents, do not assume that the materials, equipment or methods will be approved as equal unless the item has been specifically so approved for this Work by the Architect.

4. Substitution Requests:

   a. The Contract is based on the standards of quality established in the Contract Documents. Substitutions will be considered only when requested at time of bidding and when substantiated by the submittal of required data.
   b. Substitution requests made prior to bidding will require an Addendum to notify all bidders of allowable alterations.

      1) No substitution requests will be accepted within ten (10) working days of the bid date.

   c. Substitutions after the award of Contract are governed by Section 01 25 00: Substitution Procedures.

5. Review authority:

   a. Unless directed otherwise, all submittals shall be made according to Section 01 33 00.

DIVISION 01

SECTION 01 70 00: PROJECT CLOSEOUT

01 70 00.01: GENERAL

A. SCOPE

1. The Contractor shall supply all documents and provide all labor and materials required to comply with all items of the project closeout procedure as specified herein.

01 70 00.02: PROCEDURE

A. SUBSTANTIAL COMPLETION

1. The Contractor shall notify the Architect of substantial completion of the project and shall prepare a list of items remaining to be completed.

2. Within seven (7) days of notification by the Contractor, the Architect shall conduct an inspection to determine whether or not substantial completion has been achieved.

3. If the Architect finds the project to be substantially complete, he shall prepare a Certificate of Substantial Completion and a list of items the Contractor must complete or correct before final payment will be made.

B. FINAL COMPLETION

1. Upon completion and/or correction of the items noted by the Architect, the Contractor shall submit the following documents to the Architect:

    a. Final Application and Certificate for Payment - Four (4) copies
    b. Contractor's Affidavit of Debts and Claims - Four (4) copies
    c. Contractor's Release and Waiver of Claim - Four (4) copies
    d. Contractor's Guarantees - Four (4) copies
    e. Operation and Service Manuals - Three (3) copies
    f. Original As-Builts - One (1) copy

2. The Contractor also shall submit to the Architect one complete set of Record Drawings with any changes or modifications noted.

3. When the Architect determines that all items of work have been completed in Agreement with the Contract Documents, he will issue the Final Certificate of Payment for the Owner's action.

DIVISION 02

SECTION 02 06 00: SUBSURFACE INFORMATION AND UNDERGROUND OBSTRUCTIONS

02 06 00.01: GENERAL

1. A subsurface exploration was conducted on this site and a report of findings was prepared and issued to the Architect by the Owner. These are included as a part of this specification.

2. Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil bearings. It is expressly understood that Owner or Architect will not be responsible for interpretations or conclusions drawn there by the contractor. Data are made available for convenience of Contractor.

3. Additional test borings and other exploratory operations may be made by Contractor at no cost to Owner.

4. The plans show the approximate location of underground and overhead utilities known to lie in the path of construction for the proposed utility mains. The Contractor shall be responsible for determining the exact location of these and other utilities, including service lines, and shall mark their location in a conspicuous manner so as to avoid damage to said utilities by trenching operations.

5. In the event subsurface structures are broken or damaged in the prosecution of the work, the Contractor shall immediately notify the proper authorities and shall be responsible for any damage to persons or property caused by such breaks.

6. The Contractor shall also be responsible for uncovering the existing pipe lines to which connections are to be made before trenching in the vicinity of said pipe lines in order that the connections to the lines may be made in the most economical and expeditious manner.

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ECS Southeast, LLP

Geotechnical Engineering Report

New Folkstone Elementary School

Stump Sound Township, North Carolina

ECS Project Number # 22:27624

March 22, 2019

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ECS SOUTHEAST, LLP
"Setting the Standard for Service"
Geotechnical • Construction Materials • Environmental • Facilities
NC Registered Engineering Firm F-1078
NC Registered Geologists Firm C-406
SC Registered Engineering Firm 3252

March 22, 2019

Mr. Steve Myers
Onslow County Schools
P.O. Box 99
Jacksonville, North Carolina 28541

ECS Project No. 22:27624

Reference: Geotechnical Engineering Report
New Folkstone Elementary
Stump Sound Township, Onslow County, North Carolina

Dear Mr. Myers:

ECS Southeast, LLP (ECS) has completed the subsurface exploration and geotechnical engineering analyses for the above-referenced project. Our services were performed in general accordance with our Proposal No. 22:22687R1, dated February 25, 2019. This report presents our understanding of the geotechnical aspects of the project, the results of the field exploration conducted, and our design and construction recommendations.

It has been our pleasure to be of service to Onslow County Schools during the design phase of this project. We would appreciate the opportunity to remain involved during the continuation of the design phase, and we would like to provide our services during construction phase operations as well to verify the assumptions of subsurface conditions made for this report. Should you have any questions concerning the information contained in this report, or if we can be of further assistance to you, please contact us.

Respectfully submitted,

ECS Southeast, LLP

Mike Ellis, E.I.
Project Manager
MEllis@ecslimited.com

Winslow Goins, PE
Principal Engineer
WGoins@ecslimited.com

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EXECUTIVE SUMMARY

The following summarizes the main findings of the exploration, particularly those that may have a cost impact on the planned development. Further, our principal foundation recommendations are summarized. Information gleaned from the executive summary should not be utilized in lieu of reading the entire geotechnical report.

- The geotechnical exploration performed for the planned development included five (5) electronic cone penetration test (CPT) soundings, six (6) standard penetration test (SPT) borings and nine (9) hand auger borings with (4) Kessler dynamic cone penetrometer (DCP) tests.

- The soundings generally encountered Clayey, Silty and Clean SAND (SC, SM, SP) with layers of Silty and Sandy CLAY (CL-ML) underlain by limestone.

- The proposed building can be supported with a shallow foundation having an allowable bearing pressure of 1,500 psf.

- ECS understands that approximately 6 to 7 feet of structurally approved fill will be placed on the site. ECS recommends that the fill should be on site for at least 1 month prior to construction of the footings for the building. Undercutting in the upper 2 to 3 feet prior to placing structural fill should be expected during the construction of the building.

- Prior to the placement of structural fill, around 1 to 2 feet of undercutting during the construction of the parking and drive areas should be anticipated.

- Groundwater was encountered at the surface to approximately 0.3 feet below existing grades at the site. Due to high groundwater table may be present on the site, temporary construction dewatering operations may be required prior to placing structural fill on the site

- Based on the results of the CPT soundings and our evaluation of the site, the site shall be assigned a seismic class “D”.

1.0 INTRODUCTION

1.1 GENERAL

ECS' understanding of this project is based on information provided by Mr. Randy Baker, AIA of Pinnacle Architecture, P.A. and Tim Stewart, P.E. of Parker & Associates, Inc. The site is located off of Folkstone Road in Stump Sound Township, Onslow County, North Carolina. The project consists of constructing an elementary school with associated drive and parking areas. This report contains the results of our subsurface explorations, site characterization, engineering analyses, and recommendations for the design of the proposed construction.

1.2 SCOPE OF SERVICES

To obtain the necessary geotechnical information required for design of the proposed elementary school, a total of five (5) CPT soundings were performed, six (6) SPT borings and nine (9) hand auger borings with Kessler DCP tests. Shear wave velocity tests were performed in sounding S-5 for seismic site classification and liquefaction potential. This report discusses our exploratory and testing procedures, presents our findings and evaluations and includes the following:

- A brief review and description of our field test procedures and the results of testing conducted;
- A review of surface topographical features and site conditions;
- A review of area and site geologic conditions;
- A review of subsurface soil stratigraphy with pertinent available physical properties;
- Preliminary foundation recommendations;
  - Allowable bearing pressure;
  - Settlement estimates (total and differential);
- Site development recommendations;
- Suitability of soils for use as fill material;
- Pavement design recommendations;
- Discussion of groundwater impact;
- Compaction recommendations;
- Special conditions encountered;
- Seismic site classification and liquefaction potential;
- Field data records consisting of CPT sounding logs, SPT Boring Logs and hand auger logs;
- Site vicinity map; and
- Exploration location plan; and
- CPT sounding logs.

1.3 AUTHORIZATION

Our services were provided in accordance with our Proposal No. 22-22697R1, dated February 25, 2019, as authorized by Onslow County Schools on February 27, 2019, and include the Terms and Conditions of Service outlined with our proposal.

2.0 PROJECT INFORMATION

2.1 PROJECT LOCATION

The site is located off of Folkstone Road in Stump Sound Township, Onslow County, North Carolina. The site can be further identified by NC PIN 425800401636.Figure 2.1.1 below shows an aerial image of the site.

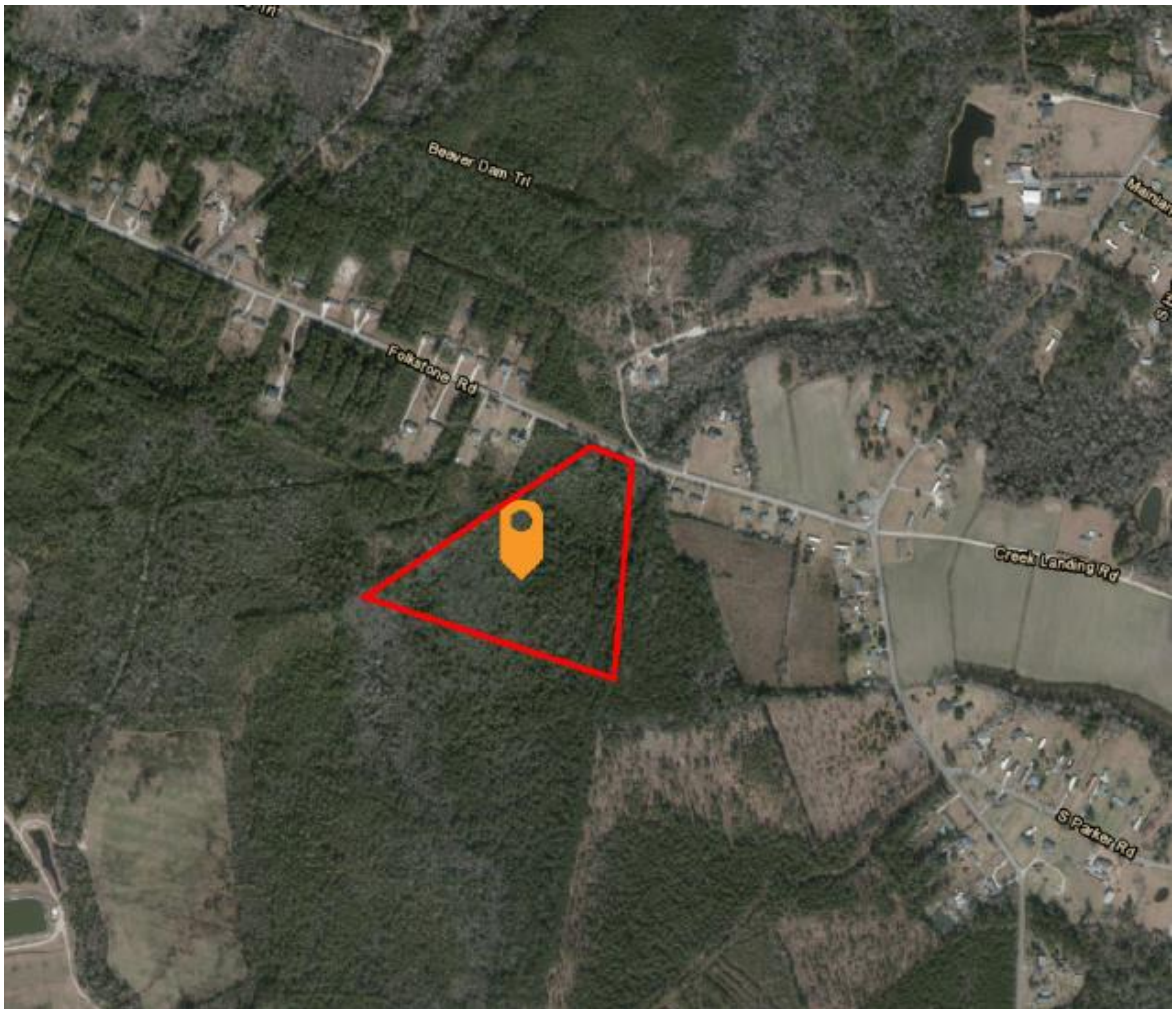


Figure 2.1.1 Site Location

2.2 CURRENT SITE CONDITIONS

The site consists of a cleared lot with typical site elevations ranging from around 30 to 33 feet. Standing water was present at select locations of the site.

2.3 PROPOSED CONSTRUCTION

The project consists of constructing a proposed elementary school with associated drive and parking areas with a pump station.

2.3.1 Site Civil Features

- Grading for the building pad and the pavement areas.

2.3.2 Structural Information/Loads

The following information explains our assumed structural loads for the purpose of the recommendations made in this report:

Table 2.3.2.1 Design Values

SUBJECT	DESIGN INFORMATION / EXPECTATIONS
Usage	Institutional
Column Loads	N/A
Wall Loads	Up to 8 kips/ft
Finish Floor Elevation	6 to 7 feet above grade

3.0 FIELD EXPLORATION

3.1 FIELD EXPLORATION PROGRAM

The field exploration was planned with the objective of characterizing the project site in general geotechnical and geological terms and to evaluate subsequent field data to assist in the determination of geotechnical recommendations.

3.1.1 Cone Penetrometer Soundings

The subsurface conditions were explored by drilling five (5) electronic cone penetration test (CPT) soundings within the proposed building areas. CPT sounding S-5 was advanced to a refusal depth of approximately 47 feet beneath the existing ground surface.

Sounding locations were located in the field by an ECS representative using a hand held GPS unit and referencing existing site features. The approximate as-drilled sounding location is shown on the Exploration Location Diagram in Appendix A.

The CPT soundings were conducted in general accordance with ASTM D 5778. The cone used in the soundings has a tip area of 10 cm^2 and a sleeve area of 150 cm^2. The CPT soundings recorded tip resistance and sleeve friction measurements to assist in determining pertinent index and engineering properties of the site soils. The ratio of the sleeve friction to tip resistance is then used to aid in assessing the soil types through which the tip is advanced. The results of the CPT soundings are presented in Appendix B.

Within sounding S-3, seismic tests were performed at approximately three foot intervals to refusal to measure the shear wave velocity (v_s) of the subsurface materials to aid in assessing the dynamic response properties of the site subsurface materials. The seismic shear waves are generated by making impact with a 20-pound sledgehammer onto a steel beam. The impacts are initiated on the right and left sides of the CPT rig and the corresponding wave traces recorded on an oscilloscope are analyzed to determine the shear wave velocity of the tested material. The waves are measured with three geophones that are installed in the cone. The results of the CPT soundings are presented in Appendix B.

3.1.2 Standard Penetration Test Borings

The subsurface conditions were explored by drilling six (6) standard penetration borings to approximately 25 feet beneath the ground surface. Mud rotary drilling was used to advance the borings.

Boring locations were identified in the field by an ECS staff engineer using a handheld GPS unit and referencing existing features prior to mobilization of the drilling equipment.

Standard penetration tests (SPTs) were conducted in the borings at regular intervals in general accordance with ASTM D 1586. Small representative samples were obtained during these tests and were used to classify the soils encountered. The standard penetration resistances obtained provide a general indication of soil shear strength and compressibility.

The approximate as-drilled boring locations are shown on the exploration location diagram in Appendix A. The results of the SPT Borings are presented in Appendix B. The elevations shown on the SPT borings logs were interpolated from the provided site plan and should be considered approximate.

3.1.3 Hand Auger Borings with Kessler Dynamic Cone Penetrometer Tests

Nine (9) Kessler Dynamic Cone Penetrometer (DCP) tests were performed in the proposed pavement areas. The hand auger borings were classified with the Unified Soil Classification System (USCS).

The Kessler DCP is used to estimate the strength characteristics of soils. The Kessler DCP was continuously driven approximately 3 feet below the existing ground surface. The Kessler DCP is driven into the soil by dropping a Dual-Mass 17.6 lb Hammer from a height of 22.6 inches. The depth of cone penetration is measured at selected penetration or hammer drop intervals and the soil shear strength is reported in terms of the Kessler DCP index. The Kessler DCP index is based on the average penetration depth resulting from one blow of the 17.6 lb hammer. The Kessler DCP index can be correlated to CBR and modulus of rigidity. The individual results of the Kessler DCP tests and Hand Auger Boring Logs are presented in Appendix B. The elevations shown on the hand auger logs were interpolated from the provided site plan and should be considered approximate.

3.2 REGIONAL/SITE GEOLOGY

The site is located in the Coastal Plain Physiographic Province of North Carolina. The Coastal Plain is composed of seven terraces, each representing a former level of the Atlantic Ocean. Soils in this area generally consist of sedimentary materials transported from other areas by the ocean or rivers. These deposits vary in thickness from a thin veneer along the western edge of the region to more than 10,000 feet near the coast. The sedimentary deposits of the Coastal Plain rest upon consolidated rocks similar to those underlying the Piedmont and Mountain Physiographic Provinces. In general, shallow unconfined groundwater movement within the overlying soils is largely controlled by topographic gradients. Recharge occurs primarily by infiltration along higher elevations and typically discharges into streams or other surface water bodies. The elevation of the shallow water table is transient and can vary greatly with seasonal fluctuations in precipitation.

Based on the U.S. Geological Survey[1,2] the proposed construct site lies within the River Bend Formation. Soils in the River Bend Formation typically contain alluvial sands and clays with patches of limestone. An overview of the general site geology is illustrated in Figure 3.2.1 below.

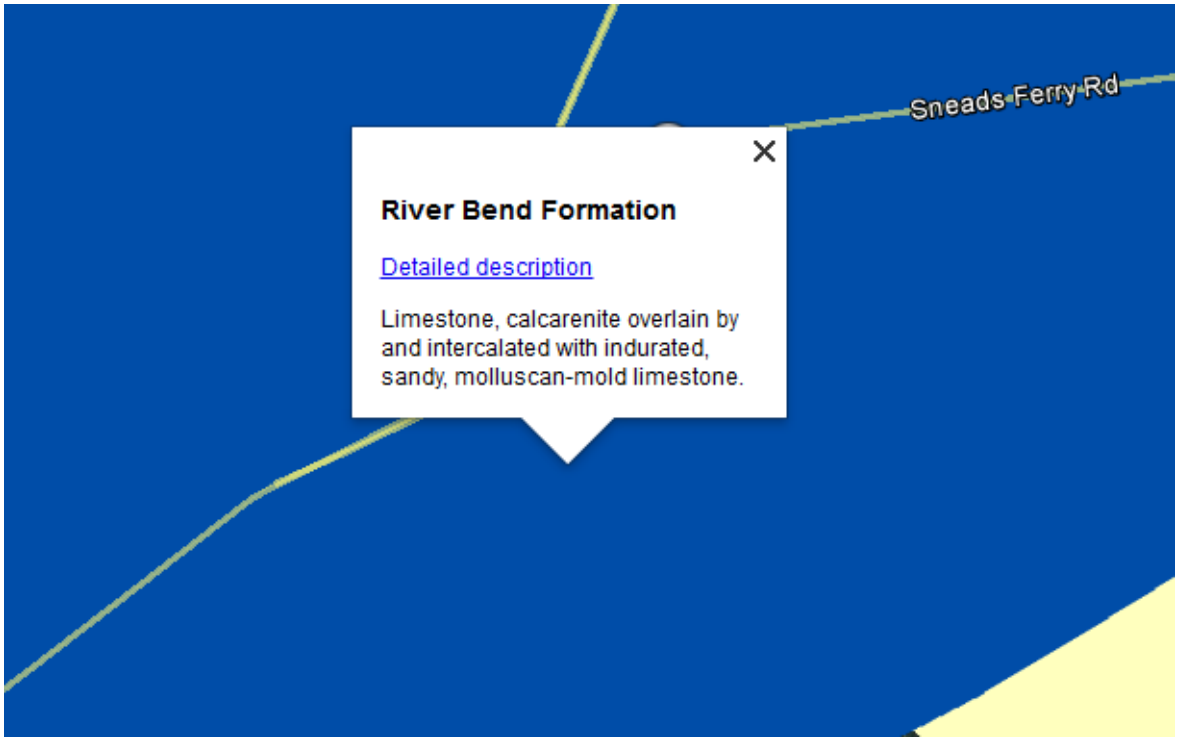


Figure 3.2.1

Geologic map for Figure 3.2.1 obtained from The North Carolina Dept. of Environment, Health, and Natural Resources, Division of Land Resources, NC Geological Survey, in cooperation with the NC Center for Geographic Information and Analysis, 1998, Geology - North Carolina (1:250,000), coverage data file geol250 and Google Earth.

[1] The North Carolina Dept. of Environment, Health, and Natural Resources, Division of Land Resources, NC Geological Survey, in cooperation with the NC Center for Geographic Information and Analysis, 1998, Geology - North Carolina (1:250,000), coverage data file geol250. The data represents the digital equivalent of the official State Geology map (1:500,000 scale), but was digitized from (1:250,000 scale) base maps.

[2] Rhodes, Thomas S., and Conrad, Stephen G., 1985, Geologic Map of North Carolina: Department of Natural Resources and Community Development, Division of Land Resources, and the NC Geological Survey, 1:500,000-scale, compiled by Brown, Philip M., et al, and Parker, John M. III, and in association with the State Geologic Map Advisory Committee.

3.3 SUBSURFACE CHARACTERIZATION

The subsurface conditions encountered were generally consistent with published geological mapping. The following sections provide generalized characterizations of the soil encountered during our subsurface exploration. For subsurface information at a specific location, refer to the CPT Sounding Logs and Hand Auger Logs in Appendix B.

Table 3.3.1 Subsurface Stratigraphy

Approximate Depth Range (ft)	Stratum	Description	Ranges of SPT[(1)] N-Values and N*-Values[(2)] blows per foot (bpf)
0 to 1	N/A	Borings performed throughout topsoil at depths ranging from approximately 5 to 14 inches. Deeper topsoil or organic laden soils are most likely present in wet, poorly drained areas and potentially unexplored areas of the site.	N/A
1 to 18	I	Very loose to Medium Dense, Clayey, Silty and Clean SAND (SC, SM, SP), Wet to Saturated	0 to 20
18 to 37.5	II	Very Soft to Stiff, Sandy SILT (ML), Silty CLAY (CL-ML) and Lean CLAY (CL) with interbedded layers of Very Loose to Loose, Clayey and Silty SAND (SC, SM), Saturated	0 to 10
37.5to 46.5	III	Loose to Very Dense, Silty and Clean SAND (SM, SP) with interbedded layers of Soft to Hard Sandy SILT (ML) and Soft to Firm Silty CLAY (CL-ML) and Lean CLAY (CL), Saturated	10 to 50+
46.5	IV	LIMESTONE	50+

Notes: (1) Standard Penetration Test
(2) Equivalent Corrected Standard Penetration Test Resistances

3.4 GROUNDWATER OBSERVATIONS

Porewater pressure measurements were made at the sounding locations during exploration as noted on the CPT sounding logs in Appendix B. The apparent groundwater depths in the SPT borings and CPT soundings were observed to range from the surface to approximately 0 to 0.3 feet below the ground surface.

The highest groundwater observations are normally encountered in the late winter and early spring. Variations in the long-term water table may occur as a result of changes in precipitation, evaporation, surface water runoff, construction activities, and other factors not immediately apparent at the time of this exploration. If long term water levels are crucial to the development of this site, it would be prudent to verify water levels with the use of perforated pipes or piezometers.

4.0 DESIGN RECOMMENDATIONS

4.1 BUILDING DESIGN

The following sections provide recommendations for foundation, floor slab and seismic design.

4.1.1 Foundations

Shallow Foundations: Provided that the subgrades are prepared as discussed herein, the proposed structure can be supported by conventional shallow foundations. ECS understands that approximately 6 to 7 feet of structurally approved fill will be placed on the site. ECS recommends that the fill should be on site for at least 1 month prior to construction of the footings for the building. Undercutting in the upper 2 to 3 feet prior to placing structural fill should be expected during the construction of the building. The design of the foundation shall utilize the following parameters:

Table 4.1.1.1 Foundation Design

Design Parameter	Wall Footing
Net Allowable Bearing Pressure[1]	1,500 psf
Acceptable Bearing Soil Material	Stratum I or Approved Structural Fill
Minimum Width	18 inches
Minimum Footing Embedment Depth (below slab or finished grade)	12 inches
Estimated Total Settlement	1 inch
Estimated Differential Settlement	Less than 0.5 inches

1. Net allowable bearing pressure is the applied pressure in excess of the surrounding overburden soils above the base of the foundation.

It will be important to have the geotechnical engineer of record observe the foundation subgrade prior to placing foundation concrete; to confirm the bearing soils are what was anticipated. If soft or unsuitable soils are observed at the footing bearing elevations, the unsuitable soils should be undercut and removed. Any undercut should be backfilled with approved structural fill up to the original design bottom of footing elevation; the original footing shall be constructed on top of the structural fill. The depth and lateral extent of the undercut should be determined in the field during undercutting operation. An ECS representative must be on site during the undercut and backfill of the areas in order to provide a report stating that the repairs were in accordance with our recommendations.

4.1.2 Floor Slabs

It appears that the slabs for the structure will bear on structural fill. The following graphic depicts our soil-supported slab recommendations:

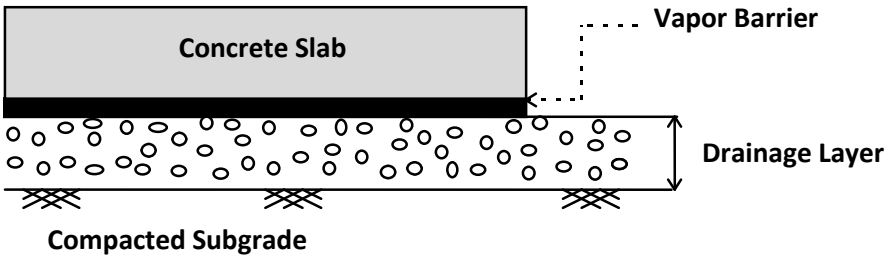


Figure 4.1.2.1

1. Drainage Layer Thickness: 6 inches
2. Drainage Layer Material: GRAVEL (GP, GW), SAND containing <3% fines (SP, SW)
3. Subgrade compacted to 98% maximum dry density per ASTM D698

Subgrade Modulus: Provided the "Subgrade Preparations" and "Earthwork Operations" Sections of this report are followed, the slab may be designed assuming a modulus of subgrade reaction, k of 150 pci (lbs/cu. inch). The modulus of subgrade reaction value is based on a 1 ft by 1 ft plate load test basis.

Slab Isolation: Ground-supported slabs should be isolated from the foundations and foundation-supported elements of the structure so that differential movement between the foundations and slab will not induce excessive shear and bending stresses in the floor slab. Where the structural configuration prevents the use of a free-floating slab, the slab should be designed with suitable reinforcement and load transfer devices to preclude overstressing of the slab. Maximum differential settlement of soils supporting interior slabs is anticipated to be less than 0.5 inches in 50 feet.

4.1.3 Seismic Design Considerations

Seismic Site Classification: The International Building Code (IBC) 2015 requires site classification for seismic design based on the upper 100 feet of a soil profile. Three methods are utilized in classifying sites, namely the shear wave velocity (v_s) method; the unconfined compressive strength (s_u) method; and the Standard Penetration Resistance (N-value) method. The first method (shear wave velocity) was used in classifying this site.

The results of the shear wave velocity profile are contained in Appendix B. The seismic site class definitions for the weighted average of shear wave velocity or SPT N-value in the upper 100 feet of the soil profile are shown in the following table:

Table 4.1.3.1: Seismic Site Classification

Site Class	Soil Profile Name	Shear Wave Velocity, Vs, (ft./s)	N value (bpf)
A	Hard Rock	Vs > 5,000 fps	N/A
B	Rock	2,500 < Vs ≤ 5,000 fps	N/A
C	Very dense soil and soft rock	1,200 < Vs ≤ 2,500 fps	>50
D	Stiff Soil Profile	600 ≤ Vs ≤ 1,200 fps	15 to 60
E	Soft Soil Profile	Vs < 600 fps	<15

The North Carolina Building Code (2015 International Building Code with North Carolina Amendments) requires that a seismic Site Class be assigned for new structures. The seismic Site Class for the site was determined by calculating a weighted average of the shear velocities of the overburden to the depth of rock/refusal. The CPT test data indicates that the existing natural, overburden soils at the site have shear velocities ranging from approximately 240 ft/sec to 1,022 ft/sec. The weighted average value for the site is 759ft/sec. Based on the results of the CPT soundings and our evaluation of the site, the site shall be assigned a seismic class "D".

Liquefaction: The potential for liquefaction at the site is considered low based upon the CPT results and the liquefaction index procedure developed by Iwasaki (1982). Based on our CPT results and our evaluation using a site peak ground acceleration of 0.13, an earthquake event with a magnitude of 7.3 and procedures developed by Boulanger & Idriss (2014), the liquefaction induced settlement at the subject site is estimated to be less than 2 inches.

Ground Motion Parameters: The design spectral response acceleration parameters for a seismic site class "D" are shown in Table 4.1.3.2. Mapped Reponses were estimated from https://seismicmaps.org.

Table 4.1.3.2: Ground Motion Parameters (IBC 2015/ASCE 7-10 Method)

Period (sec)	Mapped Spectral Response Accelerations (g)		Values of Site Coefficient for Site Class		Maximum Spectral Response Acceleration Adjusted for Site Class (g)		Design Spectral Response Acceleration (g)	
0.2	S_S	0.165	F_a	1.6	$S_{MS}=F_aS_s$	0.264	$S_{DS}=2/3\ S_{MS}$	0.176
1.0	S_1	0.076	F_v	2.4	$S_{M1}=F_vS_1$	0.182	$S_{D1}=2/3\ S_{M1}$	0.121

The Site Class definition should not be confused with the Seismic Design Category designation, which the Structural Engineer typically assesses.

4.2.1 Pavement Sections

Subgrade Characteristics: Based on the results of our hand auger borings, it appears that the soils that will be exposed as pavement subgrades will consist of structurally approved fill. Based on similar projects, a CBR value of 10 has been selected to model the subgrade soils. The pavement design assumes subgrades consist of suitable materials evaluated by ECS and placed and compacted to at least 98 percent of the maximum dry density as determined by the standard Proctor test (ASTM D 698) in accordance with the project specifications. Due to loose and soft soil soils, undercutting in the range of approximately 1 to 2 feet should be anticipated in areas of the proposed parking and drive areas prior to placing structurally approved fill.

Design Considerations: For the design and construction of exterior pavements, the subgrades should be prepared in strict accordance with the recommendations in the "Subgrade Preparation" and "Engineered Fill Placement" sections of this report. An important consideration with the design and construction of pavements is surface and subsurface drainage. Where standing water develops, either on the pavement surface or within the base course layer, softening of the subgrade and other problems related to the deterioration of the pavement can be expected. Furthermore, good drainage should minimize the possibility of the subgrade materials becoming saturated during the normal service period of the pavement.

Anticipated traffic conditions were not provided to ECS. However, based on our experience for light duty traffic for similar projects, a flexible pavement section may consist of at least 2 inches of surface mix asphalt overlying at least 6 inches of grade aggregate base in the parking areas. Similarly, a heavy duty, flexible pavement section may consist of at least 3 inches of surface mix asphalt overlying at least 8 inches of graded aggregate base in the roadway areas. The graded aggregate based course materials beneath pavements should be compacted to at least 98 percent of their modified Proctor maximum dry density (ASTM D 1557).

Regardless of the section and type of construction utilized, saturation of the subgrade materials and asphalt pavement areas results in a softening of the subgrade material and shortened life span for the pavement. Therefore, we recommend that both the surface and subsurface materials for the pavement be properly graded to enhance surface and subgrade drainage. By quickly removing surface and subsurface water, softening of the subgrade can be reduced and the performance of the parking area can be improved. Site preparation for the parking areas should be similar to that for the building area including stripping, proofrolling, and the placement of compacted structural fill.

Please note that large, front-loading trash dumpsters frequently impose concentrated front-wheel loads on pavements during loading. This type of loading typically results in rutting of bituminous pavements and ultimately pavement failures and costly repairs. Consequently, we recommend the use of an 8 inch thick, mesh reinforced concrete slab that extends the entire length of the truck. Concrete pavements should be properly jointed and reinforced as needed to help reduce the potential for cracking and to permit proper load transfer.

5.0 SITE CONSTRUCTION RECOMMENDATIONS

5.1 SUBGRADE PREPARATION

5.1.1 Stripping and Grubbing

The subgrade preparation should consist of stripping all vegetation, rootmat, topsoil, existing fill, and any other soft or unsuitable materials from the 10-foot expanded building area and 5-foot expanded pavement areas. ECS should be called on to verify that topsoil and unsuitable surficial materials have been completely removed prior to the placement of structural fill or construction of the building and parking lot.

5.1.2 Proofrolling

After removing all unsuitable surface materials, cutting to the proposed grade, and prior to the placement of any structural fill or other construction materials, the exposed subgrade should be examined by the geotechnical engineer or authorized representative. The exposed subgrade should be thoroughly proofrolled with previously approved construction equipment having a minimum axle load of 10 tons (e.g. fully loaded tandem-axle dump truck). The areas subject to proofrolling should be traversed by the equipment in two perpendicular (orthogonal) directions with overlapping passes of the vehicle under the observation of the geotechnical engineer or authorized representative. This procedure is intended to assist in identifying any localized yielding materials. In the event that unstable or "pumping" subgrade is identified by the proofrolling, those areas should be marked for repair prior to the placement of any subsequent structural fill or other construction materials. Methods of repair of unstable subgrade, such as undercutting or moisture conditioning, should be discussed with the geotechnical engineer to determine the appropriate procedure with regard to the existing conditions causing the instability. Test pits may be excavated to explore the shallow subsurface materials in the area of the instability to help in determined the cause of the observed unstable materials and to assist in the evaluation of the appropriate remedial action to stabilize the subgrade. Prior to the placement of structural fill, undercutting to depths of approximately 2 to 3 feet in the building areas and approximately 1 to 2 feet in the parking and drive areas should be anticipated.

5.1.3 Site Temporary Dewatering

Subsurface Water: Due to the relatively shallow groundwater encountered at select locations during this exploration, temporary construction dewatering may be necessary prior to placing structurally approved fill on the site. Dewatering operations for the majority of the site can be handled by the use of conventional submersible pumps directly in the excavation or temporary trenches or French drains consisting of free draining granular stone wrapped in filter fabric to direct the flow of water and to remove water from the excavation. If temporary sump pits are used, we recommend they be established at an elevation 3 to 5 feet below the bottom of the excavation subgrade or bottom of footing. A perforated 55 gallon drum or other temporary structure could be used to house the pump. We recommend continuous dewatering of the excavations using electric pumps or manned gasoline pumps be used during construction.

5.2 EARTHWORK OPERATIONS

5.2.1 Structural Fill Materials

Product Submittals: Prior to placement of structural fill, representative bulk samples (about 50 pounds) of on-site and off-site borrow should be submitted to ECS for laboratory testing, which will include Atterberg limits, natural moisture content, grain-size distribution, and moisture-density relationships for compaction. Import materials should be tested prior to being hauled to the site to determine if they meet project specifications.

Satisfactory Structural Fill Materials: Materials satisfactory for use as structural fill should consist of inorganic soils classified as SM, SC, SW, SP, GW, GP, GM, and GC, or a combination of these group symbols, per ASTM D 2487. Natural fine-grained soils classified as clays or silts (CL, ML) should generally not be considered for use as engineered fill, but may be evaluated by the geotechnical engineer to determine their suitability at the contractor's request. The materials should be free of organic matter, debris, and should contain no particle sizes greater than 4 inches in the largest dimension. Open graded materials, such as gravels (GW and GP), which contain void space in their mass should not be used in structural fills unless properly encapsulated with filter fabric. Suitable structural fill material should have the index properties shown in Table 5.2.1.1.

Table 5.2.1.1 Structural Fill Index Properties

Location with Respect to Final Grade	LL	PI	Max % Fines Passing # 200 Sieve
Building Area	35 max	9 max	35
Pavement Area	35 max	9 max	35

Unsatisfactory Materials: Materials that should not be used as engineered fill include topsoil, organic materials (OH, OL), and high plasticity clays and silts (CH, MH). Such materials removed during grading operations should be either stockpiled for later use in landscape fills, or placed in approved on or off-site disposal areas.

On-Site Borrow Suitability: Near surface SANDS (SM, SP) with a fines content less than 35 percent should be suitable for re-use as structural fill. Moisture conditioning should be anticipated for the soils to achieve the optimum moisture content for fill placement.

5.2.2 Compaction

Structural Fill Compaction: Structural fill within the expanded building, pavement, and embankment limits should be placed in maximum 8-inch loose lifts, moisture conditioned as necessary to within -3 and +3 % of the soil's optimum moisture content, and be compacted with suitable equipment to a dry density of at least 98% of the standard Proctor maximum dry density (ASTM D698). Beyond these areas, compaction of at least 95% should be achieved. ECS should be called on to document that proper fill compaction has been achieved.

Fill Compaction Control: The expanded limits of the proposed construction areas should be well defined, including the limits of the fill zones for the proposed construction area, at the time of fill placement. Grade controls should be maintained throughout the filling operations. All filling operations should be observed on a full-time basis by a qualified representative of the construction testing laboratory to determine that the minimum compaction requirements are being achieved. Field density testing of fills will be performed at the frequencies shown in Table 5.2.2.1, but not less than 1 test per lift.

Table 5.2.2.1 Frequency of Compaction Tests in Fill Areas

Location	Frequency of Tests
Building Area	1 test per 2,500 sq. ft.
Utility Trenches	1 test per 200 sq. ft.
Pavement Areas	1 test per 10,000 sq. ft.

Compaction Equipment: Compaction equipment suitable to the soil type being compacted should be used to compact the subgrades and fill materials. Sheepsfoot compaction equipment should be suitable for the fine-grained soils (Clays and Silts). A vibratory steel drum roller should be used for compaction of coarse-grained soils (Sands) as well as for sealing compacted surfaces.

Fill Placement Considerations: Fill materials should not be placed on frozen soils, on frost-heaved soils, and/or on excessively wet soils. Borrow fill materials should not contain frozen materials at the time of placement, and all frozen or frost-heaved soils should be removed prior to placement of structural fill or other fill soils and aggregates. Excessively wet soils or aggregates should be scarified, aerated, and moisture conditioned.

At the end of each work day, all fill areas should be graded to facilitate drainage of any precipitation and the surface should be sealed by use of a smooth-drum roller to limit infiltration of surface water. During placement and compaction of new fill at the beginning of each workday, the Contractor may need to scarify existing subgrades to a depth on the order of 4 inches so that a weak plane will not be formed between the new fill and the existing subgrade soils.

Drying and compaction of wet soils is typically difficult during the cold, winter months. Accordingly, earthwork should be performed during the warmer, drier times of the year, if practical. Proper drainage should be maintained during the earthwork phases of construction to prevent ponding of water which has a tendency to degrade subgrade soils.

Where fill materials will be placed to widen existing embankment fills, or placed up against sloping ground, the soil subgrade should be scarified and the new fill benched or keyed into the existing material. Fill material should be placed in horizontal lifts. In confined areas such as utility trenches, portable compaction equipment and thin lifts of 3 inches to 4 inches may be required to achieve specified degrees of compaction.

We recommend that the grading contractor have equipment on site during earthwork for both drying and wetting fill soils. We do not anticipate significant problems in controlling moisture within the fill during dry weather, but moisture control may be difficult during winter months or extended periods of rain. The control of moisture content of higher plasticity soils is difficult when these soils become wet. Further, such soils are easily degraded by construction traffic when the moisture content is elevated.

5.3 GENERAL CONSTRUCTION CONSIDERATIONS

Moisture Conditioning: During the cooler and wetter periods of the year, delays and additional costs should be anticipated. At these times, reduction of soil moisture may need to be accomplished by mechanical manipulation, in order to lower moisture contents to levels appropriate for compaction. Alternatively, during the drier times of the year, such as the summer months, moisture may need to be added to the soil to provide adequate moisture for successful compaction according to the project requirements.

Subgrade Protection: Measures should also be taken to limit site disturbance, especially from rubber-tired heavy construction equipment, and to control and remove surface water from development areas. It would be advisable to designate a haul road and construction staging area to limit the areas of disturbance and to prevent construction traffic from excessively degrading sensitive subgrade soils and existing pavement areas. Haul roads and construction staging areas could be covered with excess depths of aggregate to protect those subgrades. The aggregate can later be removed and used in pavement areas.

Surface Drainage: Surface drainage conditions should be properly maintained. Surface water should be directed away from the construction area, and the work area should be sloped away from the construction area at a gradient of 1 percent or greater to reduce the potential of ponding water and the subsequent saturation of the surface soils. At the end of each work day, the subgrade soils should be sealed by rolling the surface with a smooth drum roller to minimize infiltration of surface water.

Excavation Safety: Cuts or excavations associated with utility excavations may require forming or bracing, slope flattening, or other physical measures to control sloughing and/or prevent slope failures. Contractors should be familiar with applicable OSHA codes to ensure that adequate protection of the excavations and trench walls is provided.

Excavation Considerations: Based on the results of the soundings, we expect that the natural Coastal Plain soils encountered on this site can be excavated with conventional earth moving equipment such as loaders, bulldozers, rubber tired backhoes, etc.

The site soils are OSHA Type C soils for the purpose of temporary excavation support. Excavations should be constructed in compliance with current OSHA standards for excavation and trenching safety. Excavations should be observed by a “competent person,” as defined by OSHA, who should evaluate the specific soil type and other conditions, which may control the excavation side slopes or the need for shoring or bracing. Regardless, site safety shall be the sole responsibility of the contractor and their subcontractors. Exposed earth slopes shall be protected during periods of inclement weather.

Erosion Control: The surface soils may be erodible. Therefore, the contractor should provide and maintain good site drainage during earthwork operations to maintain the integrity of the surface soils. All erosion and sedimentation controls should be in accordance with sound engineering practices and local requirements.

6.0 CLOSING

ECS has prepared this report of findings, evaluations, and recommendations to guide geotechnical-related design and construction aspects of the project.

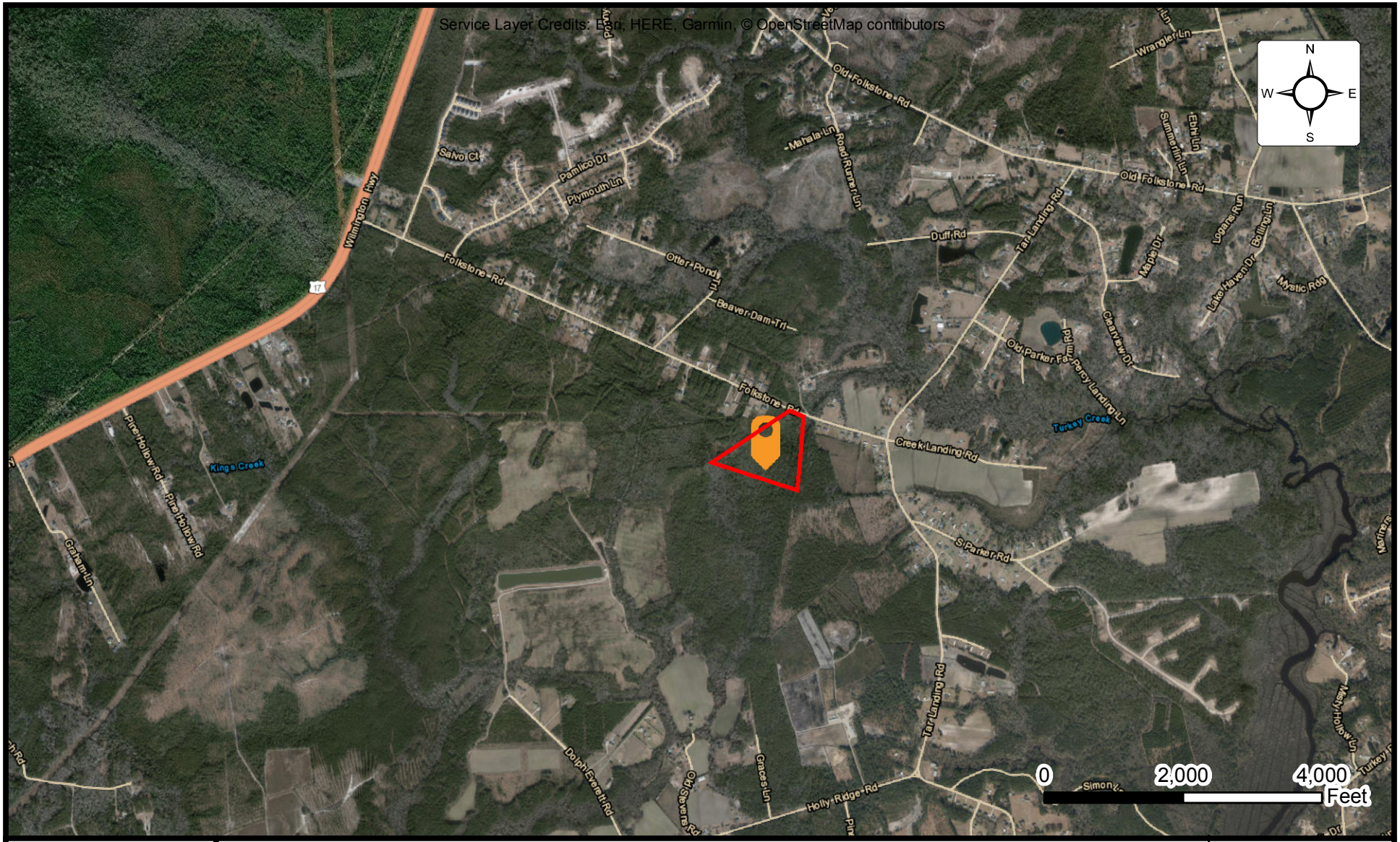
The description of the proposed project is based on information provided to ECS by Pinnacle Architecture, P.A. and Parker & Associates, Inc. If any of this information is inaccurate, either due to our interpretation of the documents provided or site or design changes that may occur later, ECS should be contacted immediately so that we can review the report in light of the changes and provide additional or alternate recommendations as may be required to reflect the proposed construction.

We recommend that ECS be allowed to review the project's plans and specifications pertaining to our work so that we may ascertain consistency of those plans/specifications with the intent of the geotechnical report.

Field observations, monitoring, and quality assurance testing during earthwork and foundation installation are an extension of and integral to the geotechnical design recommendation. We recommend that the owner retain these quality assurance services and that ECS be allowed to continue our involvement throughout these critical phases of construction to provide general consultation as issues arise. ECS is not responsible for the conclusions, opinions, or recommendations of others based on the data in this report.

APPENDIX A – Drawings & Reports

Site Location Diagram
Exploration Location Diagram



Site Location Diagram
NEW FOLKSTONE ELEMENTARY SCHOOL

STUMP SOUND TOWNSHIP, NORTH CAROLINA

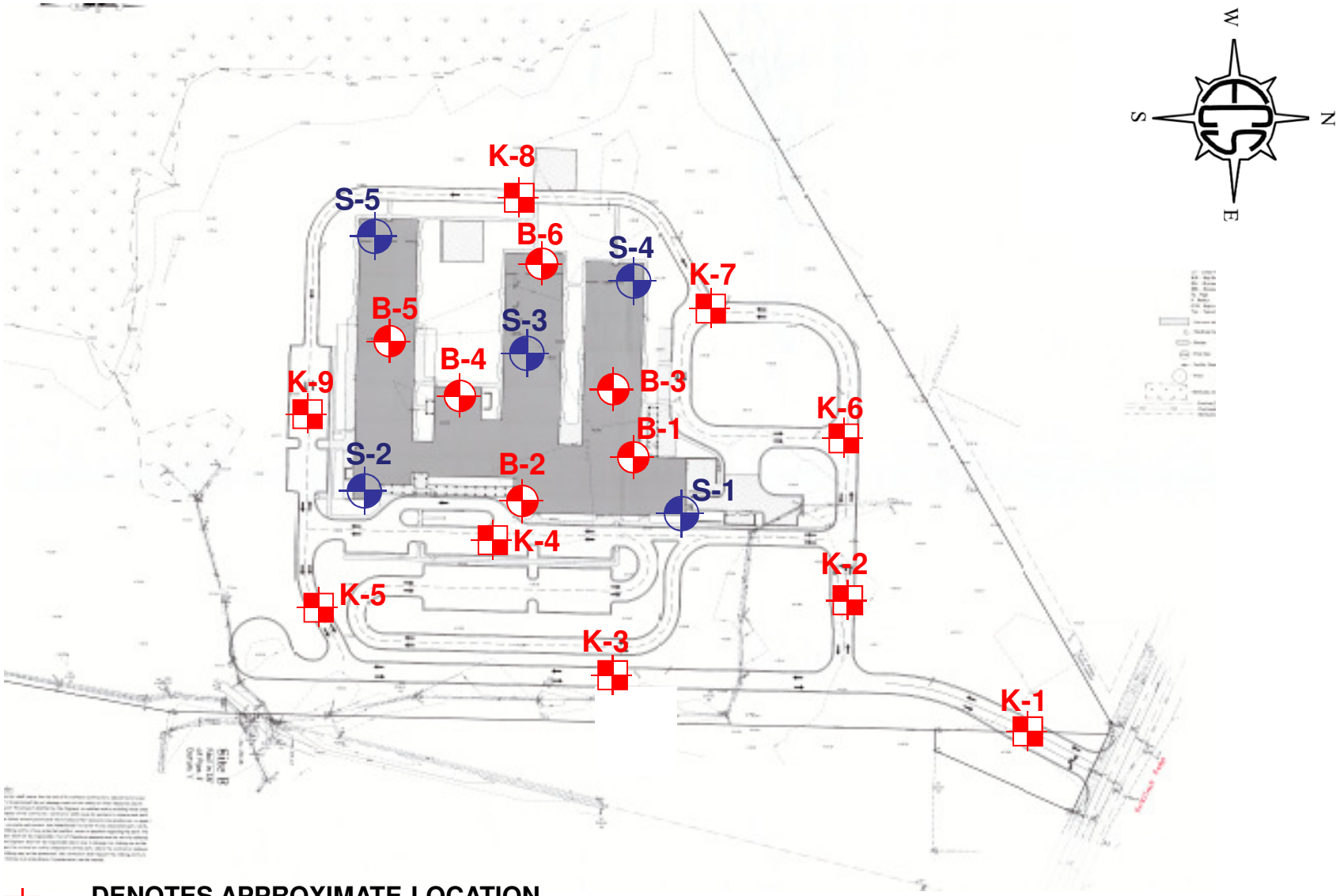
ENGINEER	WEG
SCALE	1 " = 2000 '
PROJECT NO.	22:27624
SHEET	1 OF 2
DATE	3/20/2019

EXPLORATION LOCATION DIAGRAM

New Folkstone Elementary School

Stump Sound Township, North Carolina

REFERENCE	Parker Associates, Inc Sheet C
ENGINEER	WEG
DRAFTING	MME
SCALE	NTS
PROJECT NO.	22:27624
SHEET	2 of 2
DATE	3/20/2019



DENOTES APPROXIMATE LOCATION OF HAND AUGER BORING WITH KESSLER DCP TESTS

DENOTES APPROXIMATE LOCATION OF SPT BORING

DENOTES APPROXIMATE LOCATION OF CPT SOUNDING

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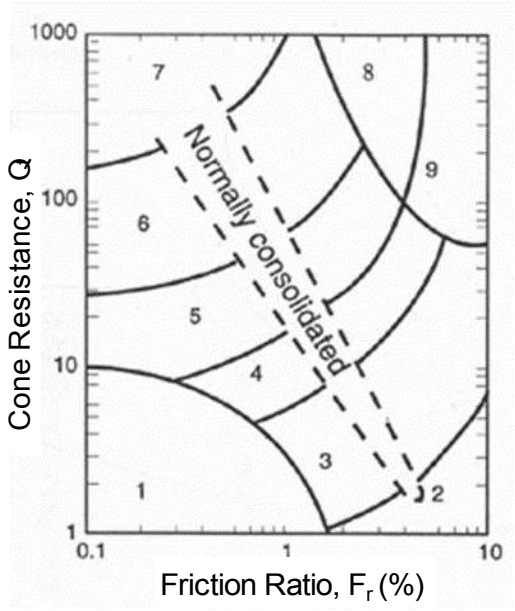
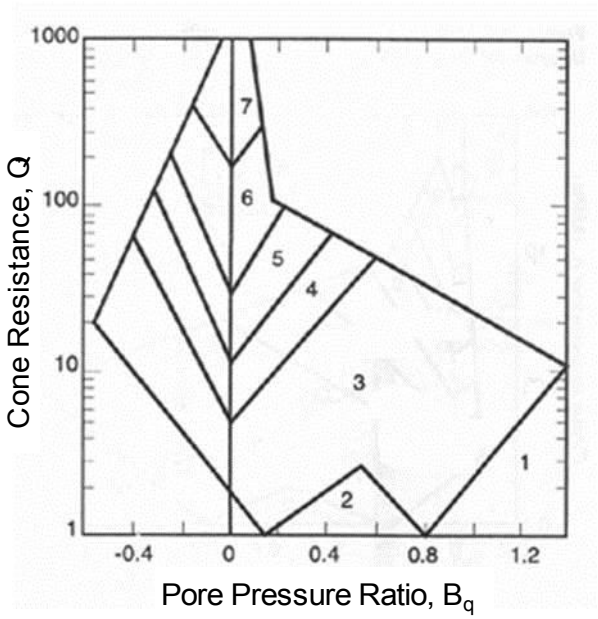
APPENDIX B – Field Operations

Reference Notes for Sounding Logs
CPT Sounding Logs - S-1 through S-5
Reference Notes for Boring Logs
SPT Boring Logs - B-1 through B-6
Kessler Logs - K-1 through K-9
Reference Notes to USCS Classification
Hand Auger Boring Logs - K-1 through K-9

REFERENCE NOTES FOR CONE PENETRATION TEST (CPT) SOUNDINGS

In the CPT sounding procedure (ASTM-D-5778), an electronically instrumented cone penetrometer is hydraulically advanced through soil to measure point resistance (q_c), pore water pressure (u_2), and sleeve friction (f_s). These values are recorded continuously as the cone is pushed to the desired depth. CPT data is corrected for depth and used to estimate soil classifications and intrinsic soil parameters such as angle of internal friction, preconsolidation pressure, and undrained shear strength. The graphs below represent one of the accepted methods of CPT soil behavior classification (Robertson, 1990).





1. Sensitive, Fine Grained
2. Organic Soils-Peats
3. Clays; Clay to Silty Clay
4. Clayey Silt to Silty Clay
5. Silty Sand to Sandy Silt
6. Clean Sands to Silty Sands
7. Gravelly Sand to Sand
8. Very Stiff Sand to Clayey Sand
9. Very Stiff Fine Grained

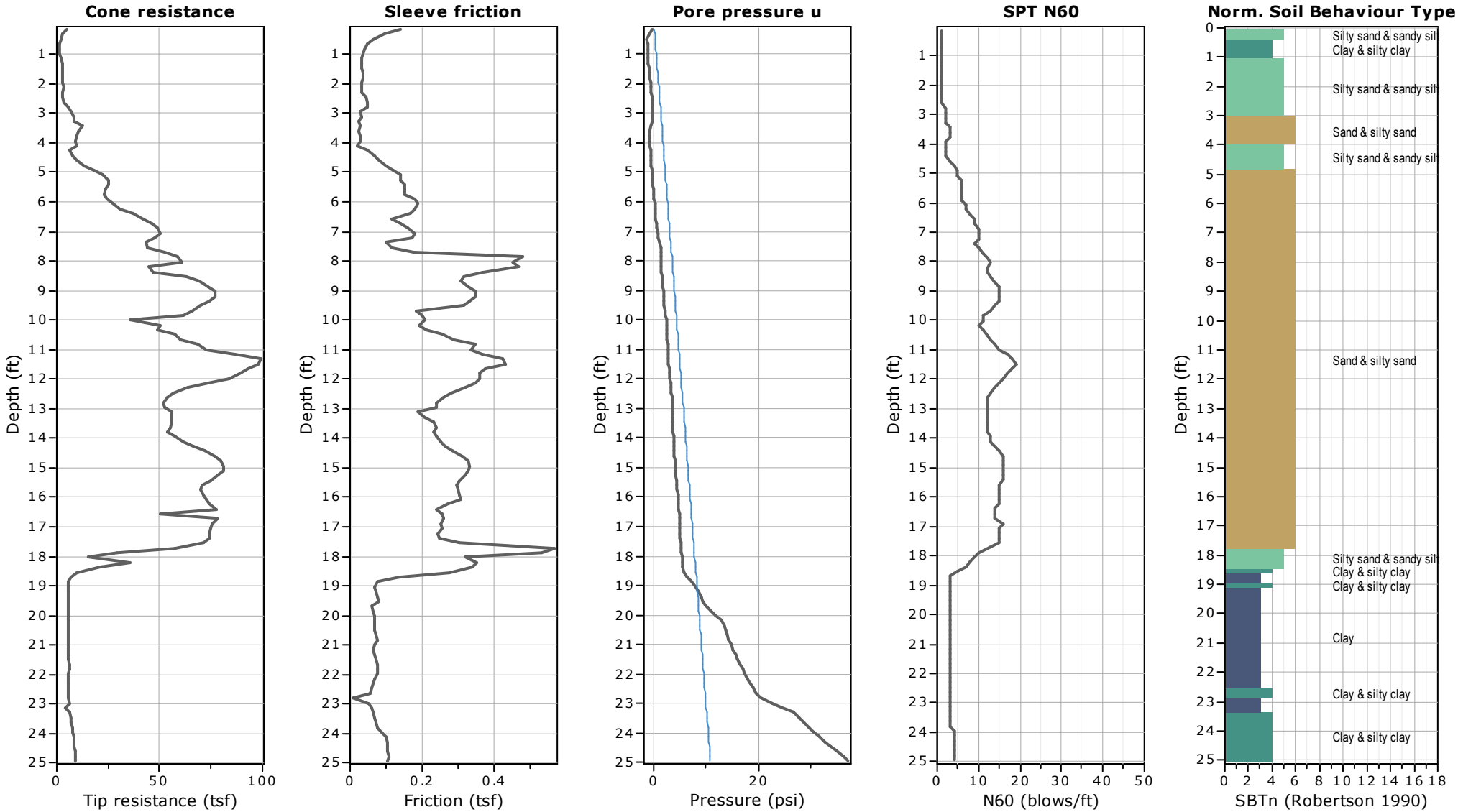
The following table presents a correlation of corrected cone tip resistance (q_c) to soil consistency or relative density:

SAND		SILT/CLAY	
Corrected Cone Tip Resistance (q_c) (tsf)	**Relative Density**	**Corrected Cone Tip Resistance (q_c) (tsf)**	**Relative Density**
<20	Very Loose	<5	Very Soft
20-40	Loose	5-10	Soft
40-120	Medium Dense	10-15	Firm
		15-30	Stiff
120-200	Dense	30-45	Very Stiff
>200	Very Dense	45-60	Hard
		>60	Very Hard

ECS Southeast, LLP
6714 Netherlands Drive
Wilmington, NC 28405
ECS Project Number 22:27624

Project: **New Folkstone Elementary**
Location: **Stump Sound Township, North Carolina**

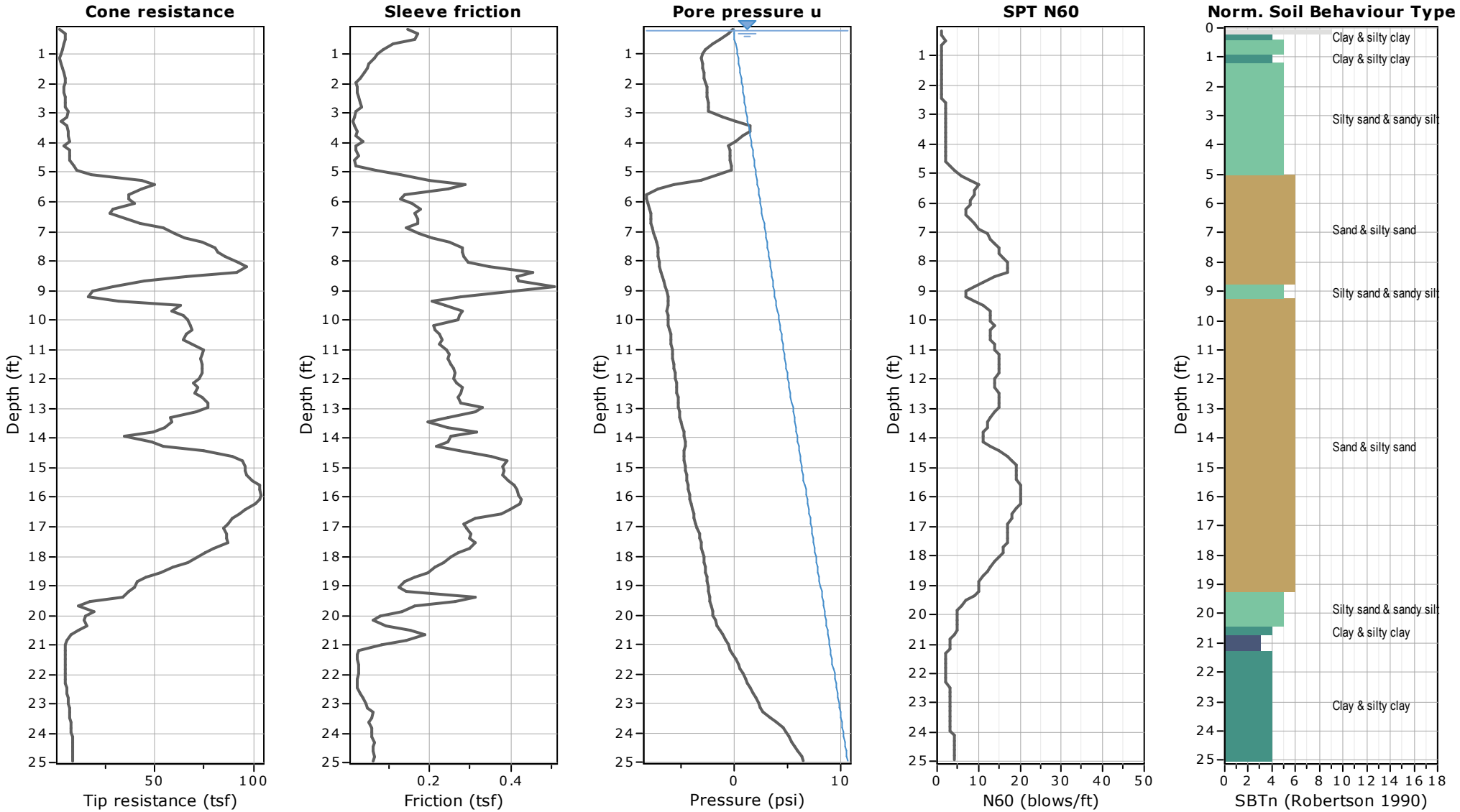
CPT: S-1
Total depth: 24.93 ft, Date: 3/5/2019
Surface Elevation: 32.00 ft
Cone Operator: Cory Robison



ECS Southeast, LLP
6714 Netherlands Drive
Wilmington, NC 28405
ECS Project Number 22:27624

Project: **New Folkstone Elementary**
Location: **Stump Sound Township, North Carolina**

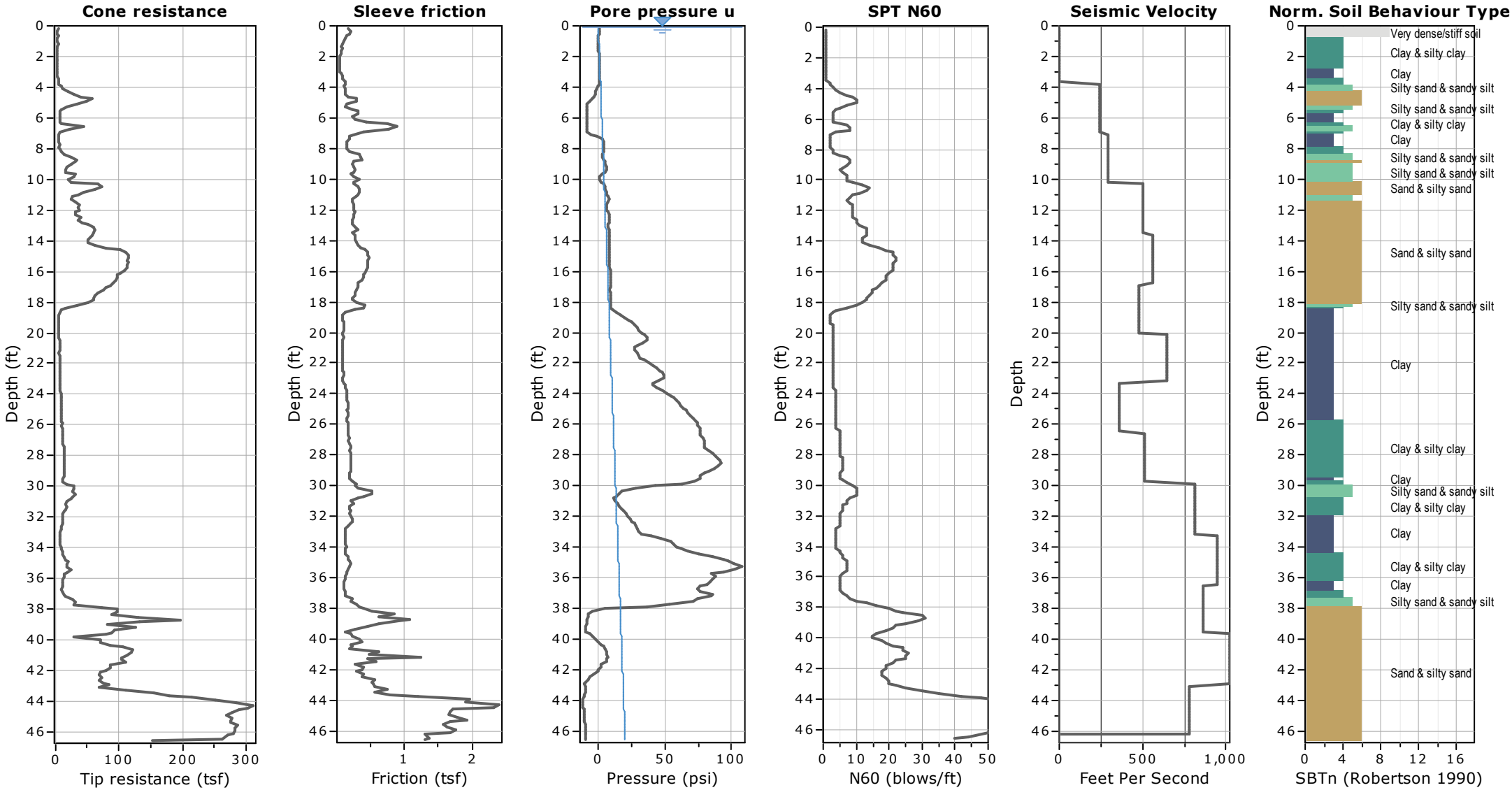
CPT: S-2
Total depth: 24.93 ft, Date: 3/5/2019
Surface Elevation: 31.00 ft
Cone Operator: Cory Robison



ECS Southeast, LLP
6714 Netherlands Drive
Wilmington, NC 28405
ECS Project Number 22:27624

Project: **New Folkstone Elementary**
Location: **Stump Sound Township, North Carolina**

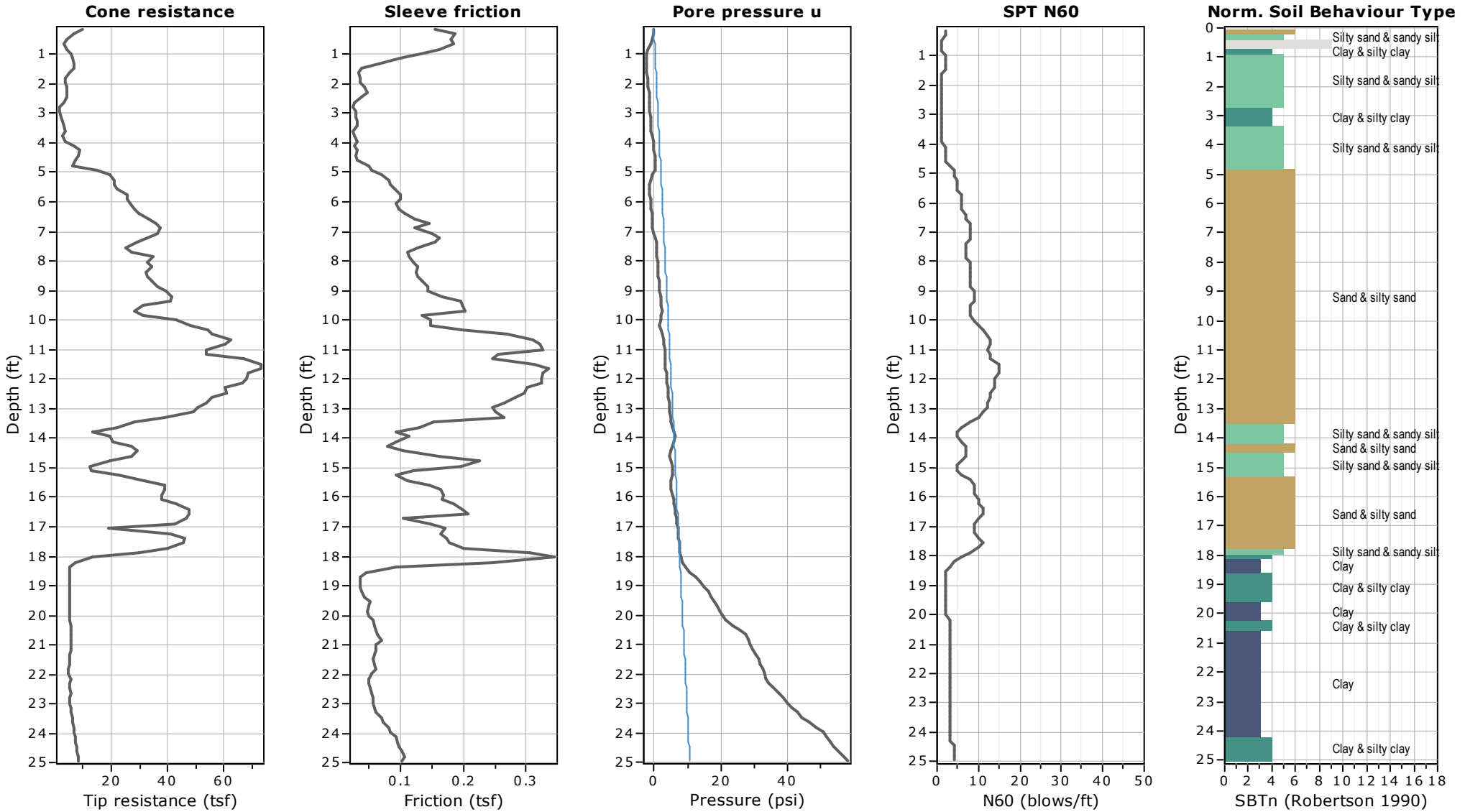
CPT: S-3
Total depth: 46.59 ft, Date: 3/5/2019
Surface Elevation: 32.00 ft
Cone Operator: Cory Robison



ECS Southeast, LLP
6714 Netherlands Drive
Wilmington, NC 28405
ECS Project Number 22:27624

Project: **New Folkstone Elementary**
Location: **Stump Sound Township, North Carolina**

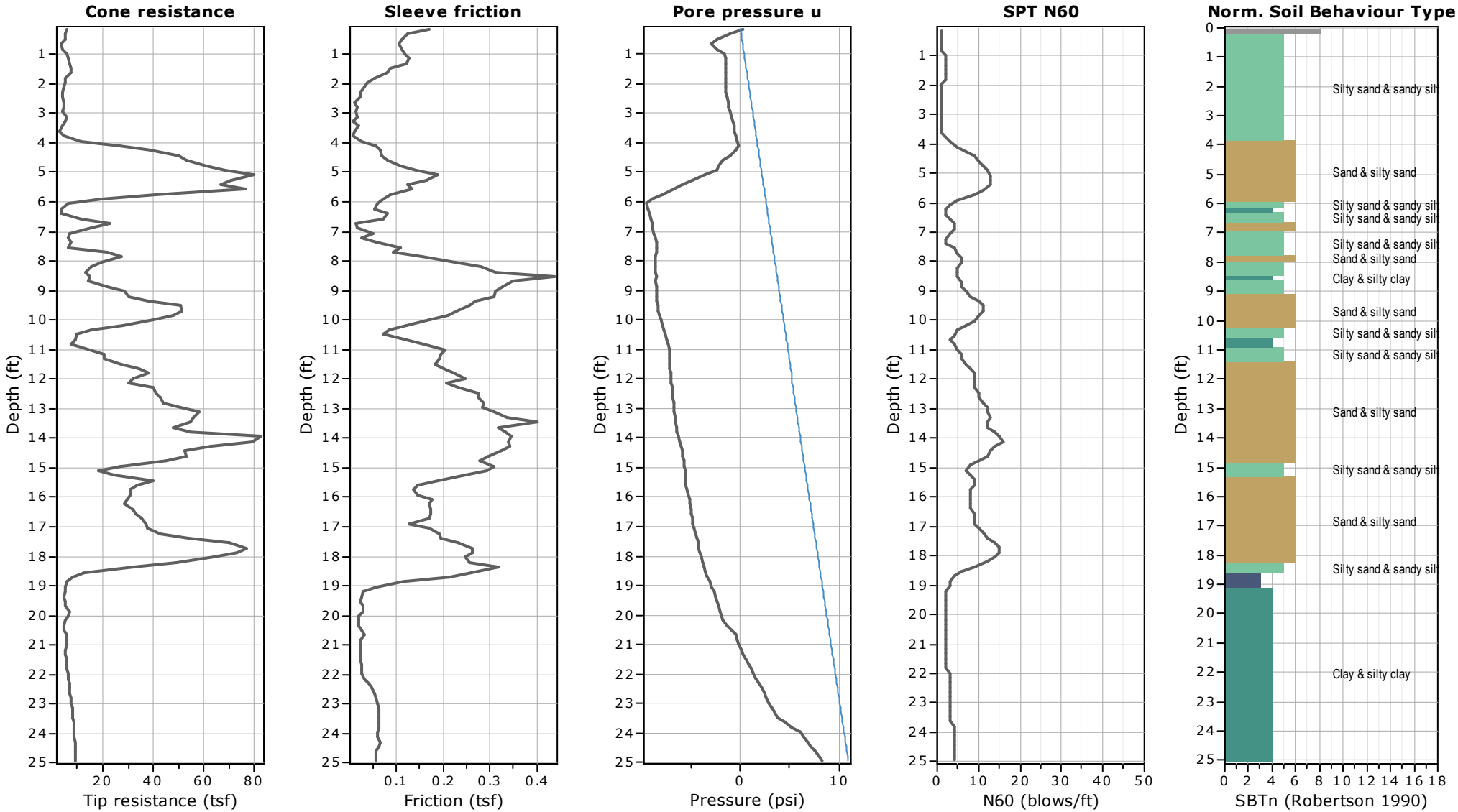
CPT: S-4
Total depth: 24.93 ft, Date: 3/5/2019
Surface Elevation: 32.00 ft
Cone Operator: Cory Robison



ECS Southeast, LLP
6714 Netherlands Drive
Wilmington, NC 28405
ECS Project Number 22:27624

Project: **New Folkstone Elementary**
Location: **Stump Sound Township, North Carolina**

CPT: S-5
Total depth: 24.93 ft, Date: 3/5/2019
Surface Elevation: 32.00 ft
Cone Operator: Cory Robison



REFERENCE NOTES FOR BORING LOGS

MATERIAL[1,2]	
	ASPHALT
	CONCRETE
	GRAVEL
	TOPSOIL
	VOID
	BRICK
	AGGREGATE BASE COURSE
	FILL[3] MAN-PLACED SOILS
GW	**WELL-GRADED GRAVEL** gravel-sand mixtures, little or no fines
GP	**POORLY-GRADED GRAVEL** gravel-sand mixtures, little or no fines
GM	**SILTY GRAVEL** gravel-sand-silt mixtures
GC	**CLAYEY GRAVEL** gravel-sand-clay mixtures
SW	**WELL-GRADED SAND** gravelly sand, little or no fines
SP	**POORLY-GRADED SAND** gravelly sand, little or no fines
SM	**SILTY SAND** sand-silt mixtures
SC	**CLAYEY SAND** sand-clay mixtures
ML	**SILT** non-plastic to medium plasticity
MH	**ELASTIC SILT** high plasticity
CL	**LEAN CLAY** low to medium plasticity
CH	**FAT CLAY** high plasticity
OL	**ORGANIC SILT or CLAY** non-plastic to low plasticity
OH	**ORGANIC SILT or CLAY** high plasticity
PT	**PEAT** highly organic soils

DRILLING SAMPLING SYMBOLS & ABBREVIATIONS			
SS	Split Spoon Sampler	PM	Pressuremeter Test
ST	Shelby Tube Sampler	RD	Rock Bit Drilling
WS	Wash Sample	RC	Rock Core, NX, BX, AX
BS	Bulk Sample of Cuttings	REC	Rock Sample Recovery %
PA	Power Auger (no sample)	RQD	Rock Quality Designation %
HSA	Hollow Stem Auger		

PARTICLE SIZE IDENTIFICATION		
DESIGNATION		**PARTICLE SIZES**
Boulders		12 inches (300 mm) or larger
Cobbles		3 inches to 12 inches (75 mm to 300 mm)
Gravel:	Coarse	¾ inch to 3 inches (19 mm to 75 mm)
	Fine	4.75 mm to 19 mm (No. 4 sieve to ¾ inch)
Sand:	Coarse	2.00 mm to 4.75 mm (No. 10 to No. 4 sieve)
	Medium	0.425 mm to 2.00 mm (No. 40 to No. 10 sieve)
	Fine	0.074 mm to 0.425 mm (No. 200 to No. 40 sieve)
Silt & Clay ("Fines")		<0.074 mm (smaller than a No. 200 sieve)

COHESIVE SILTS & CLAYS		
UNCONFINED COMPRESSIVE STRENGTH, Q_P[4]	**SPT[5] (BPF)**	**CONSISTENCY[7] (COHESIVE)**
<0.25	<3	Very Soft
0.25 - <0.50	3 - 4	Soft
0.50 - <1.00	5 - 8	Firm
1.00 - <2.00	9 - 15	Stiff
2.00 - <4.00	16 - 30	Very Stiff
4.00 - 8.00	31 - 50	Hard
>8.00	>50	Very Hard

GRAVELS, SANDS & NON-COHESIVE SILTS	
SPT[5]	**DENSITY**
<5	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
>50	Very Dense

RELATIVE AMOUNT[7]	COARSE GRAINED (%)[8]	FINE GRAINED (%)[8]
Trace	≤5	≤5
Dual Symbol *(ex: SW-SM)*	10	10
With	15 - 20	15 - 25
Adjective *(ex: "Silty")*	≥25	≥30

WATER LEVELS[6]		
	WL	Water Level (WS)(WD)
		(WS) While Sampling
		(WD) While Drilling
	SHW	Seasonal High WT
	ACR	After Casing Removal
	SWT	Stabilized Water Table
	DCI	Dry Cave-In
	WCI	Wet Cave-In

[1] Classifications and symbols per ASTM D 2488-09 (Visual-Manual Procedure) unless noted otherwise.

[2] To be consistent with general practice, "POORLY GRADED" has been removed from GP, GP-GM, GP-GC, SP, SP-SM, SP-SC soil types on the boring logs.

*[3] Non-ASTM designations are included in soil descriptions and symbols along with ASTM symbol [Ex: (SM-**FILL**)].*

[4] Typically estimated via pocket penetrometer or Torvane shear test and expressed in tons per square foot (tsf).

[5] Standard Penetration Test (SPT) refers to the number of hammer blows (blow count) of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler required to drive the sampler 12 inches (ASTM D 1586). "N-value" is another term for "blow count" and is expressed in blows per foot (bpf).

[6] The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in granular soils. In clay and cohesive silts, the determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally employed.

[7] Minor deviation from ASTM D 2488-09 Note 16.

[8] Percentages are estimated to the nearest 5% per ASTM D 2488-09.

CLIENT	Job #:	BORING #	SHEET
Onslow County Schools	22:27624	B-1	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
New Folkstone Elementary School	Pinnacle Architecture, P.A.

SITE LOCATION

Stump Sound Township, Onslow County, NC

NORTHING	EASTING	STATION

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

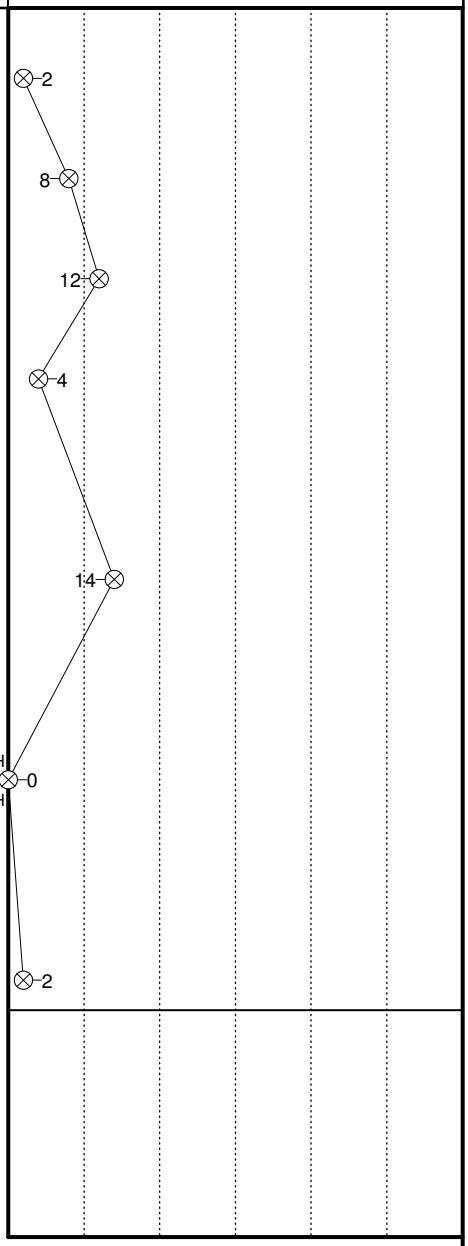
STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING ▰ LOSS OF CIRCULATION 100%

SURFACE ELEVATION 31

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					TOPSOIL/ROOTMAT [9"]			
	1	SS	18	18	(CL) SANDY CLAY, gray, very soft, wet	▽	30	1 1 1
	2	SS	18	18	(SM) SILTY FINE TO MEDIUM SAND, gray/ brown, loose, saturated			2 3 5
5	3	SS	18	18	(SP) FINE SAND, gray, medium dense to very loose, saturated		25	4 6 6
	4	SS	18	18				2 2 2
10							20	
	5	SS	18	18	(SM) SILTY FINE SAND, gray, medium dense, saturated, trace clay			5 7 7
15							15	
	6	SS	18	18	(CL) SANDY CLAY, gray, very soft, saturated			WOH WOH WOH
20							10	
	7	SS	18	18				1 1 1
25					END OF BORING @ 25'		5	
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

▽ WL 1 WS ☐ WD ☐	BORING STARTED 3/07/19	CAVE IN DEPTH 1.7
▽ WL(SHW) ▼ WL(ACR)	BORING COMPLETED 3/07/19	HAMMER TYPE Automatic
▽ WL 0.1 3/08/19	RIG CME-45C Track FOREMAN RM	DRILLING METHOD Mud Rotary

CLIENT	Job #:	BORING #	SHEET
Onslow County Schools	22:27624	B-2	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
New Folkstone Elementary School	Pinnacle Architecture, P.A.

SITE LOCATION: Stump Sound Township, Onslow County, NC

NORTHING | EASTING | STATION

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC%

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION

SURFACE ELEVATION 32

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					TOPSOIL/ROOTMAT [8"]			
	1	SS	18	18	(SC) CLAYEY FINE SAND, dark brown, very loose, wet		30	1 1 1
	2	SS	18	18	(SM) SILTY FINE TO MEDIUM SAND, gray/ brown, very loose to loose, saturated, trace roots			1 1 2
5	3	SS	18	18			25	2 3 3
	4	SS	18	18	(SP) FINE SAND, gray, loose, saturated			3 2 3
10							20	
	5	SS	18	18	(SM) SILTY FINE SAND, gray, very loose, saturated, trace clay			1 1 1
15							15	
	6	SS	18	18	(CL) SANDY CLAY, gray, very soft, saturated			1 1 1
20							10	
	7	SS	18	18				WOH WOH WOH
25					END OF BORING @ 25'		5	
30								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 1 WS ☐ WD ☐	BORING STARTED 3/07/19	CAVE IN DEPTH 7.0
WL(SHW) WL(ACR)	BORING COMPLETED 3/07/19	HAMMER TYPE Automatic
WL 0.3 3/08/19	RIG CME-45C Track FOREMAN RM	DRILLING METHOD Mud Rotary

CLIENT	Job #:	BORING #	SHEET
Onslow County Schools	22:27624	B-3	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
New Folkstone Elementary School	Pinnacle Architecture, P.A.

SITE LOCATION: Stump Sound Township, Onslow County, NC

NORTHING | EASTING | STATION

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION

SURFACE ELEVATION 33

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	DESCRIPTION OF MATERIAL
0								TOPSOIL/ROOTMAT [14"]
	1	SS	18	18		30	WOH WOH WOH 0	(SM) SILTY FINE TO MEDIUM SAND, dark brown/gray, very loose to loose, saturated, trace roots, no recovery in S-1
	2	SS	18	18			2 4 4 8	
5								
	3	SS	18	18		25	4 4 4 8	(SP) FINE SAND, gray, loose to medium dense, saturated
	4	SS	18	18			2 3 3 6	
10						20		
	5	SS	18	18			4 10 10 20	
15						15		(CL) SANDY CLAY, gray, very soft, saturated
	6	SS	18	18			WOH WOH WOH 0	
20						10		
	7	SS	18	18			WOH WOH WOH 0	
25						5		END OF BORING @ 25'
30								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 1 WS ☐ WD ☐	BORING STARTED 3/07/19	CAVE IN DEPTH 6.0
WL(SHW) WL(ACR)	BORING COMPLETED 3/07/19	HAMMER TYPE Automatic
WL 0 3/08/19	RIG CME-45C Track FOREMAN RM	DRILLING METHOD Mud Rotary

CLIENT	Job #:	BORING #	SHEET
Onslow County Schools	22:27624	B-4	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
New Folkstone Elementary School	Pinnacle Architecture, P.A.

SITE LOCATION: Stump Sound Township, Onslow County, NC

NORTHING | EASTING | STATION

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION

SURFACE ELEVATION 32

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					TOPSOIL/ROOTMAT [12"]			
	1	SS	18	18	(SC) CLAYEY FINE TO MEDIUM SAND, dark brown/gray, very loose to loose, wet to saturated, trace roots, no recovery in S-1		30	WOH WOH WOH 0
	2	SS	18	18				1 2 3 5
5					(SM) SILTY FINE TO MEDIUM SAND, gray/ brown, very loose to loose, saturated		25	1 2 2 4
	3	SS	18	18				
	4	SS	18	18				2 1 8 9
10							20	
					(SP) FINE SAND, gray, loose, saturated			
	5	SS	18	18				3 3 3 6
15							15	
					(CL) SANDY CLAY, gray, very soft, saturated			
	6	SS	18	18				WOH WOH WOH 0
20							10	
	7	SS	18	18				WOH WOH WOH 0
25					END OF BORING @ 25'		5	
30								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 1 WS ☐ WD ☐	BORING STARTED 3/07/19	CAVE IN DEPTH 9.5
WL(SHW) WL(ACR)	BORING COMPLETED 3/07/19	HAMMER TYPE Automatic
WL 0.2 3/08/19	RIG CME-45C Track FOREMAN RM	DRILLING METHOD Mud Rotary

CLIENT	Job #:	BORING #	SHEET
Onslow County Schools	22:27624	B-5	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
New Folkstone Elementary School	Pinnacle Architecture, P.A.

SITE LOCATION

Stump Sound Township, Onslow County, NC

NORTHING	EASTING	STATION

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION (100%)

SURFACE ELEVATION 32

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					TOPSOIL/ROOTMAT [9"]			
	1	SS	18	18	(CL) SANDY CLAY, gray, very soft, wet, trace roots		30	WOH WOH WOH 0
	2	SS	18	18	(SM) SILTY FINE TO MEDIUM SAND, gray/ brown, loose, saturated, trace clay in S-2			2 3 3 6
5	3	SS	18	18			25	2 2 3 5
	4	SS	18	18				5 5 4 9
10							20	
	5	SS	18	18	(SP) FINE SAND, gray, loose, saturated			3 4 4 8
15							15	
	6	SS	18	18	(SC) CLAYEY SAND, gray, very loose, saturated			WOH WOH WOH 0
20							10	
	7	SS	18	18				WOH WOH WOH 0
25					END OF BORING @ 25'		5	
30								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 1 WS ☐ WD ☐	BORING STARTED 3/07/19	CAVE IN DEPTH 8.6
WL(SHW) WL(ACR)	BORING COMPLETED 3/07/19	HAMMER TYPE Automatic
WL 0.3 3/08/19	RIG CME-45C Track FOREMAN RM	DRILLING METHOD Mud Rotary

CLIENT	Job #:	BORING #	SHEET
Onslow County Schools	22:27624	B-6	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
New Folkstone Elementary School	Pinnacle Architecture, P.A.

SITE LOCATION: Stump Sound Township, Onslow County, NC

NORTHING | EASTING | STATION

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC%

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION

SURFACE ELEVATION 32

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					TOPSOIL/ROOTMAT [10"]			
	1	SS	18	18	(SC) CLAYEY FINE SAND, dark brown, very loose to loose, wet to saturated, trace roots		30	1 1 1
	2	SS	18	18				2 4 4
5					(SM) SILTY FINE TO MEDIUM SAND, gray/ dark brown, loose and very loose, saturated		25	2 3 4
	3	SS	18	18				
	4	SS	18	18				2 1 1
10							20	
	5	SS	18	18				2 5 5
15					(CL) SANDY CLAY, gray, very soft, saturated		15	
	6	SS	18	18				WOH WOH WOH
20							10	
	7	SS	18	18				WOH WOH WOH
25					END OF BORING @ 25'		5	
30								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 1 WS ☐ WD ☐	BORING STARTED 3/07/19	CAVE IN DEPTH 6.7
WL(SHW) WL(ACR)	BORING COMPLETED 3/07/19	HAMMER TYPE Automatic
WL 0.2 3/08/19	RIG CME-45C Track FOREMAN RM	DRILLING METHOD Mud Rotary

SOIL CLASSIFICATION LEGEND

ST - SHELBY TUBE
RC - ROCK CORE
PM - PRESSURE METER
NOTE: NUMBERS IMMEDIATELY TO THE LEFT OF THE BORING PROFILE ARE SPT-N VALUES.

- GW - WELL GRADED GRAVEL
- GM - SILTY GRAVEL
- GP - POORLY GRADED GRAVEL
- GC - CLAYEY GRAVEL
- SW - WELL GRADED SAND
- ML - LOW PLASTICITY SILT
- CL - LOW PLASTICITY CLAY
- MH - HIGH PLASTICITY SILT
- SM - SILTY SAND
- SP - POORLY GRADED SAND
- SC - CLAYEY SAND
- CH - HIGH PLASTICITY CLAY
- OH - HIGH PLASTICITY ORGANIC SILTS AND CLAYS
- OL - LOW PLASTICITY ORGANIC SILTS AND CLAY
- PT - PEAT
- WR - WEATHERED ROCK
- PWR - PARTIALLY WEATHERED ROCK
- FILL
- POSSIBLE FILL
- PROBABLE FILL

SURFACE MATERIALS

- TOPSOIL
- CONCRETE
- ASPHALT
- VOID
- GRAVEL

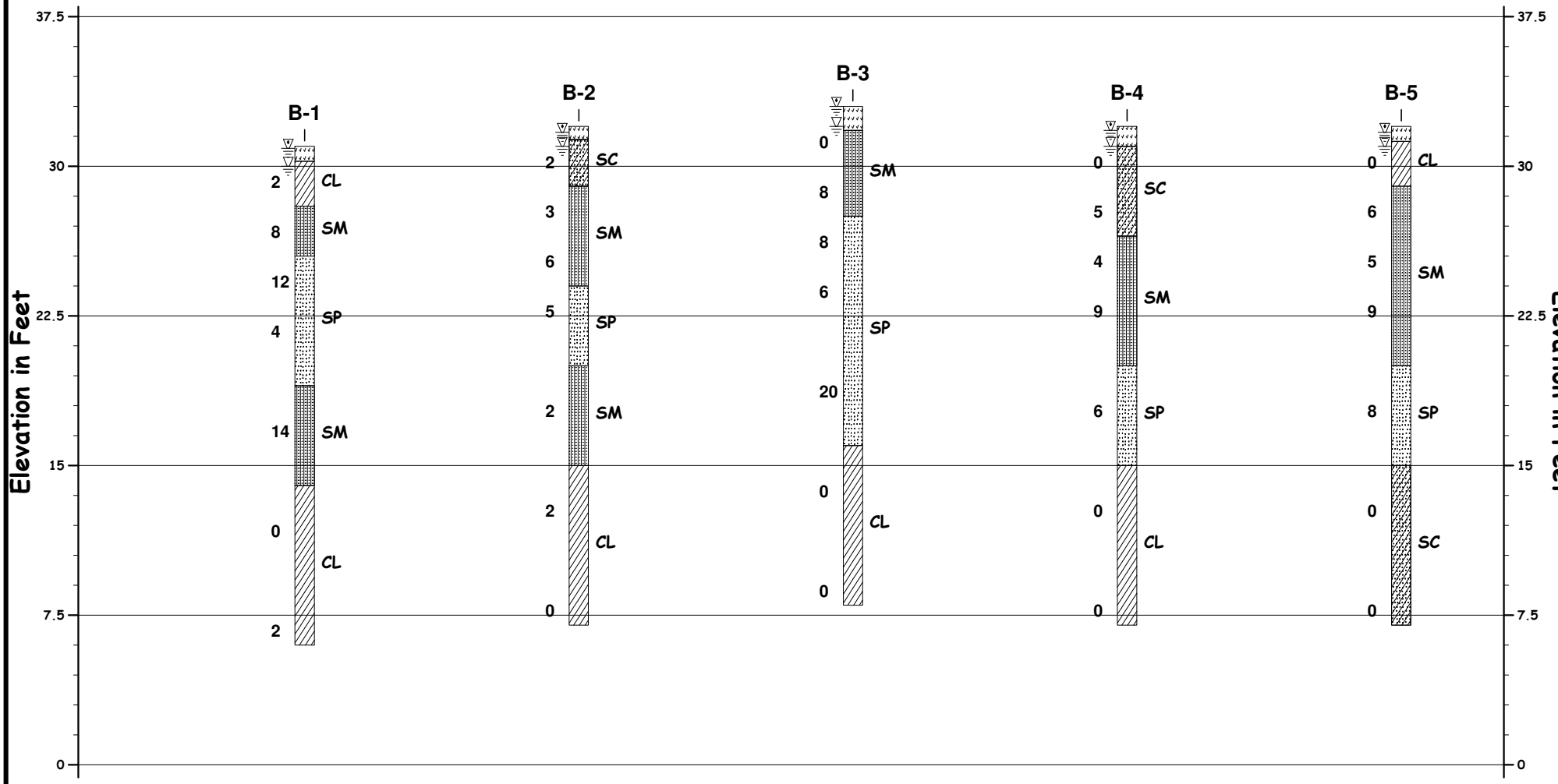
ROCK TYPES

- IGNEOUS
- METAMORPHIC
- SEDIMENTARY

SYMBOL LEGEND

- WATER LEVEL - DURING DRILLING/SAMPLING
- WATER LEVEL - SEASONAL, HIGH WATER
- WATER LEVEL - AFTER CASING REMOVAL
- WATER LEVEL - AFTER 24 HOURS

PLASTIC LIMIT% | WATER CONTENT% | % PASSING #200 SIEVE [88%] | LIQUID LIMIT%



NOTES:
1 SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.
2 PENETRATION TEST RESISTANCE IN BLOWS PER FOOT (ASTM D1586).

02-06-00-45

New Folkstone Elementary School
Onslow County Schools
Stump Sound Township, Onslow County, NC

PROJECT NO.27624 | DATE:3/20/2019 | VERTICAL SCALE:1"=7.5'

SOIL CLASSIFICATION LEGEND

GW - WELL GRADED GRAVEL
GP - POORLY GRADED GRAVEL
GM - SILTY GRAVEL
GC - CLAYEY GRAVEL
SW - WELL GRADED SAND
ML - LOW PLASTICITY SILT
ST - SHELBY TUBE
CL - LOW PLASTICITY CLAY
MH - HIGH PLASTICITY SILT
SM - SILTY SAND
RC - ROCK CORE
SP - POORLY GRADED SAND
SC - CLAYEY SAND
CH - HIGH PLASTICITY CLAY
PM - PRESSURE METER
OH - HIGH PLASTICITY ORGANIC SILTS AND CLAYS
OL - LOW PLASTICITY ORGANIC SILTS AND CLAY
PT - PEAT
NOTE: NUMBERS IMMEDIATELY TO THE LEFT OF THE BORING PROFILE ARE SPT-N VALUES.
WR - WEATHERED ROCK
PWR - PARTIALLY WEATHERED ROCK
- FILL
- POSSIBLE FILL
- PROBABLE FILL

SURFACE MATERIALS

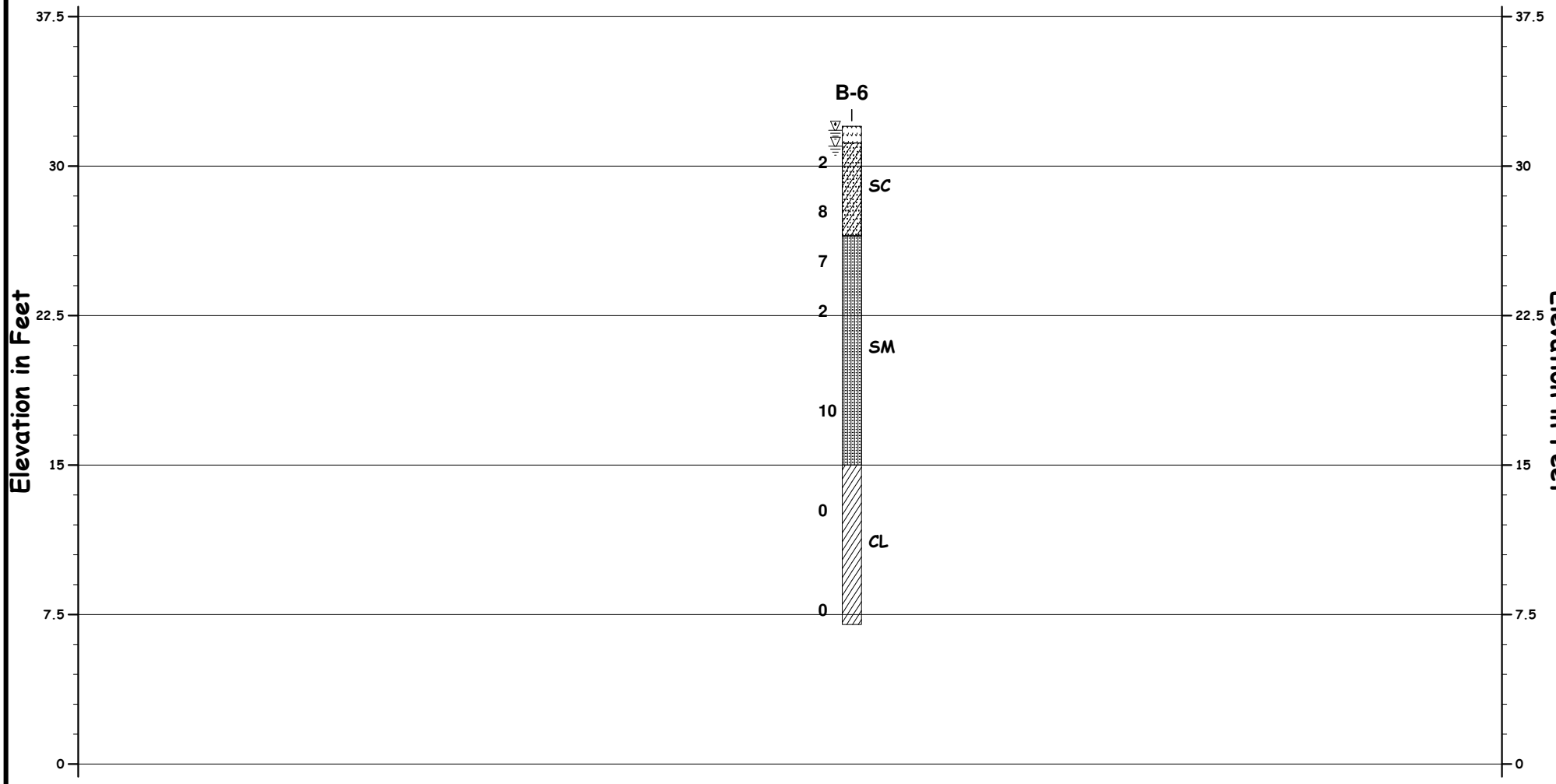
TOPSOIL
CONCRETE
ASPHALT
VOID
GRAVEL

ROCK TYPES

IGNEOUS
METAMORPHIC
SEDIMENTARY

SYMBOL LEGEND

WATER LEVEL - DURING DRILLING/SAMPLING
WATER LEVEL - SEASONAL, HIGH WATER
WATER LEVEL - AFTER CASING REMOVAL
WATER LEVEL - AFTER 24 HOURS
PLASTIC LIMIT% WATER CONTENT% % PASSING #200 SIEVE [88%] LIQUID LIMIT%



NOTES:
1 SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.
2 PENETRATION TEST RESISTANCE IN BLOWS PER FOOT (ASTM D1586).

02-06-00-46

New Folkstone Elementary School
Onslow County Schools
Stump Sound Township, Onslow County, NC

PROJECT NO.27624 | DATE:3/20/2019 | VERTICAL SCALE:1"=7.5'

DCP TEST DATA

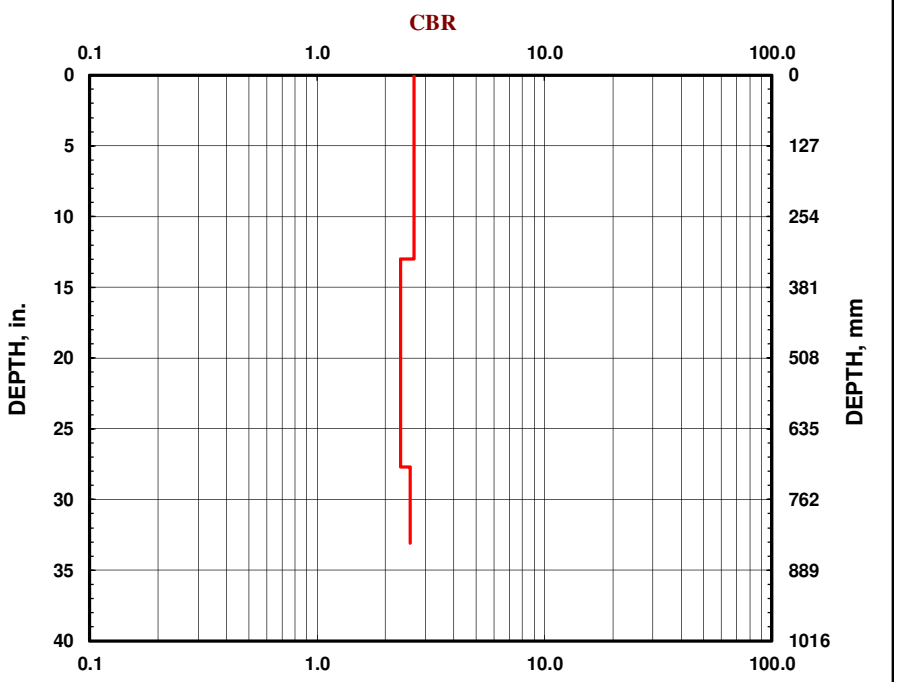
Project: New Folkstone Elementary School **Date:** 8-Mar-19

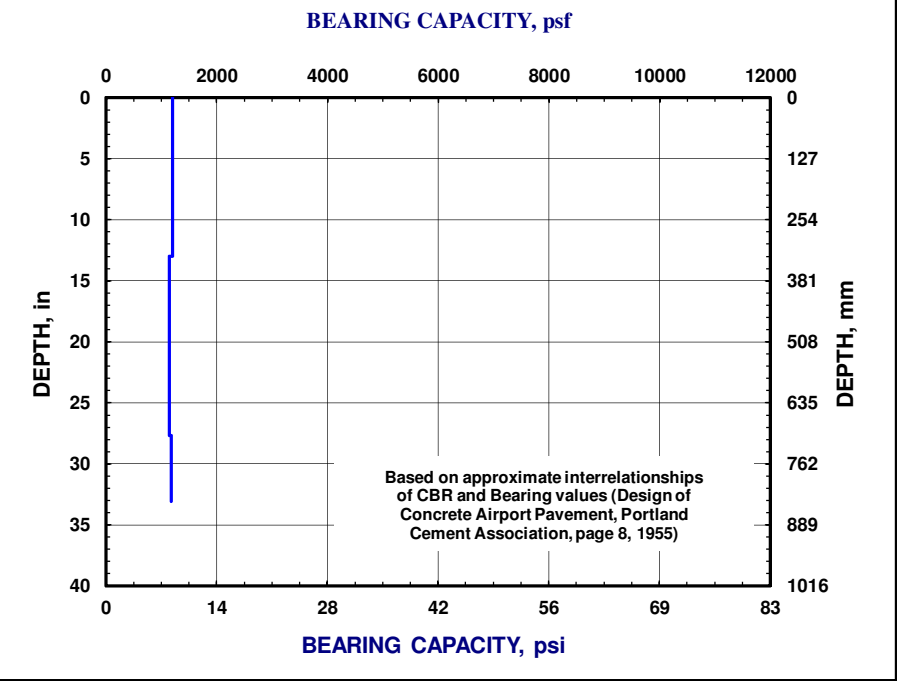
Location: K-1 **Soil Type(s):** SAND (SM, SC)

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Cumulative Penetration (mm)	Type of Hammer
0	0	1
5	330	1
5	704	1
2	841	1





DCP TEST DATA

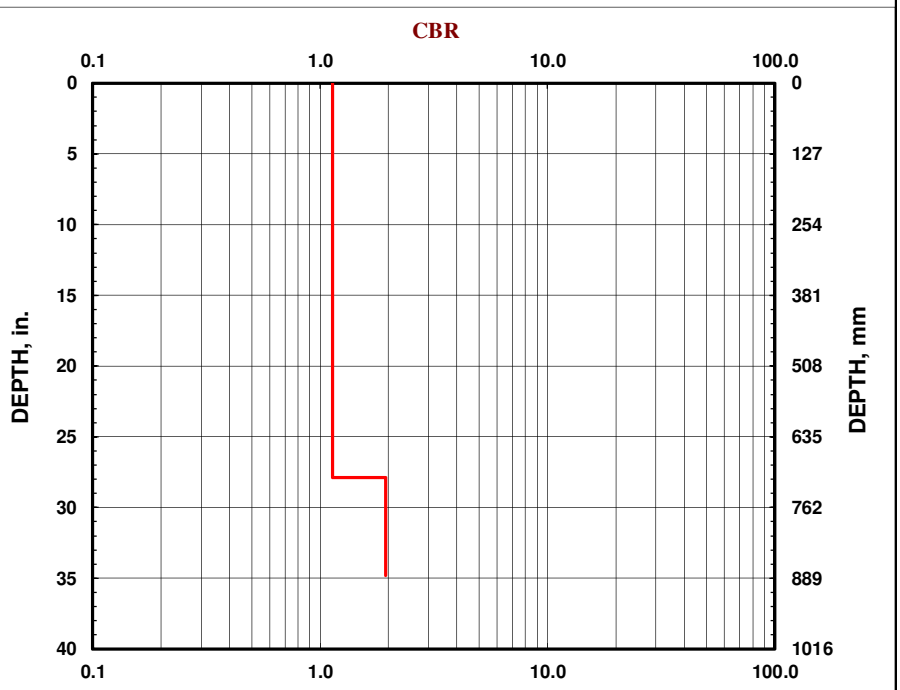
Project: New Folkstone Elementary School **Date:** 8-Mar-19

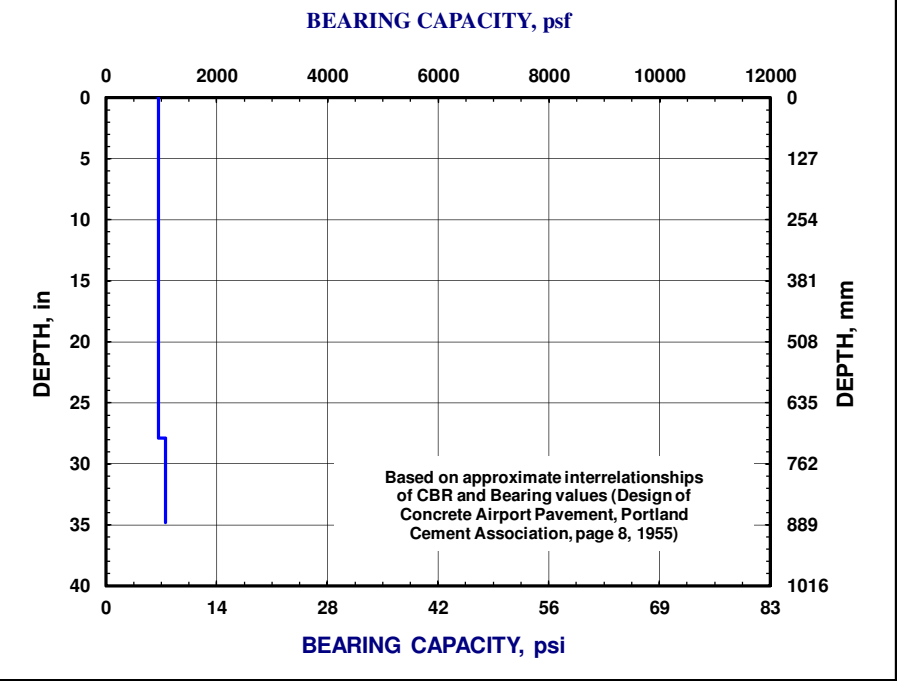
Location: K-2 **Soil Type(s):** SAND (SM)

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Cumulative Penetration (mm)	Type of Hammer
0	0	1
5	709	1
2	884	1





DCP TEST DATA

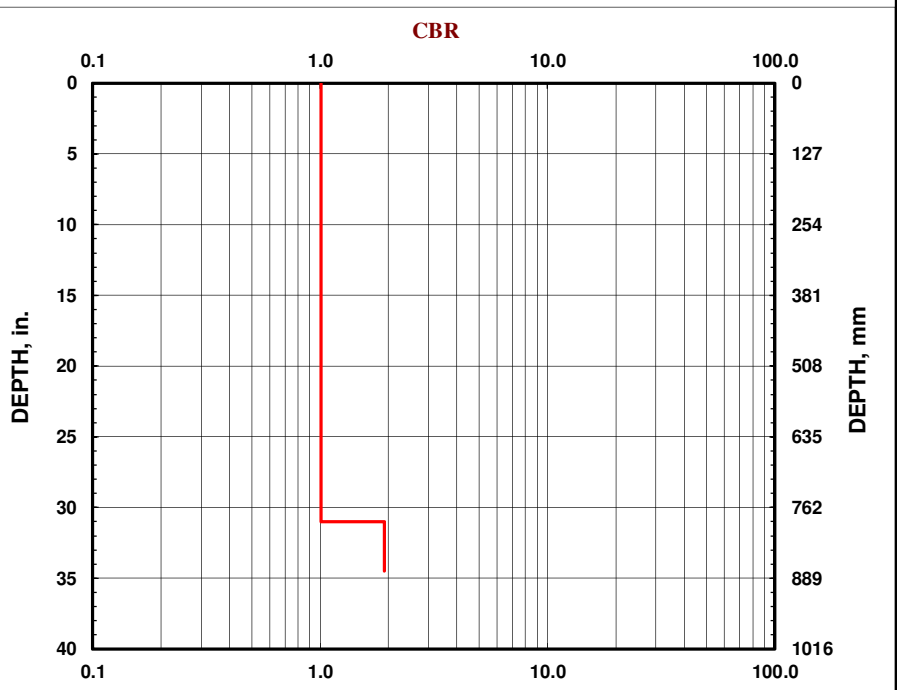
Project: New Folkstone Elementary School **Date:** 8-Mar-19

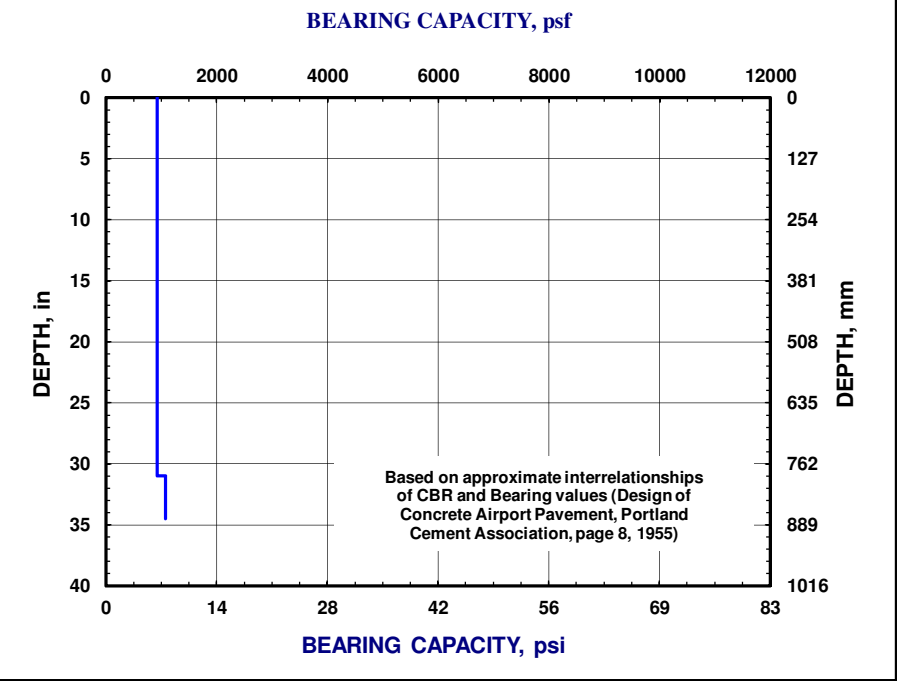
Location: K-3 **Soil Type(s):** SAND (SM)

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Cumulative Penetration (mm)	Type of Hammer
0	0	1
5	787	1
1	876	1





DCP TEST DATA

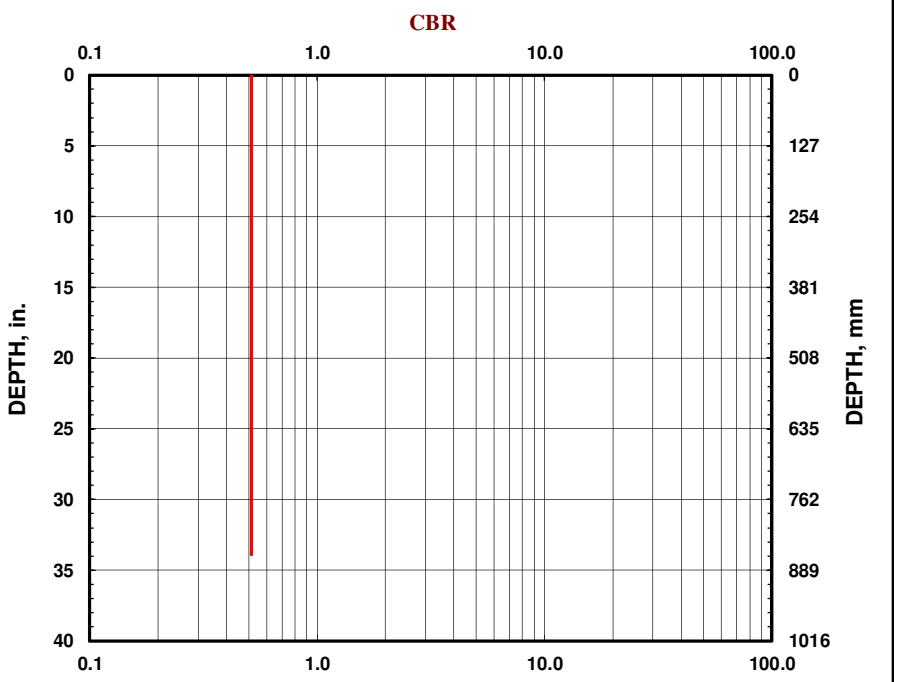
Project: New Folkstone Elementary School **Date:** 8-Mar-19

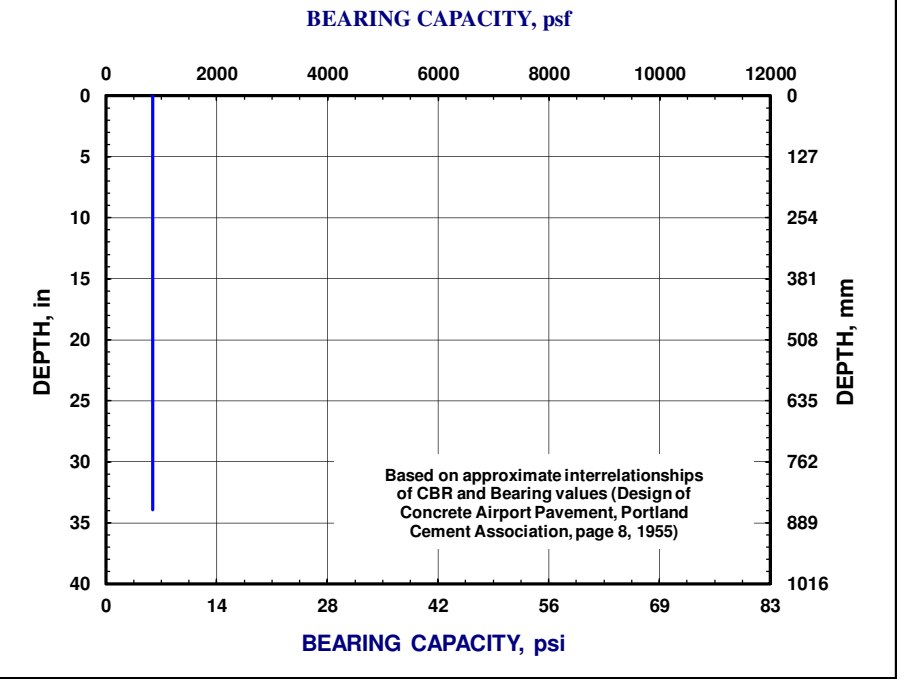
Location: K-4 **Soil Type(s):** SAND (SM)

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Cumulative Penetration (mm)	Type of Hammer
0	0	1
3	861	1





DCP TEST DATA

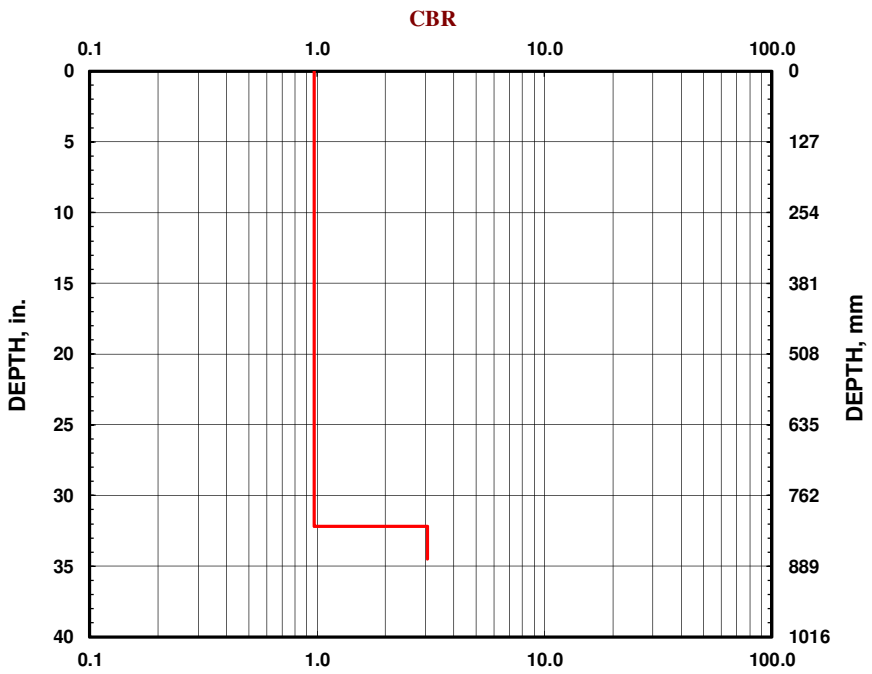
Project: New Folkstone Elementary School **Date:** 8-Mar-19

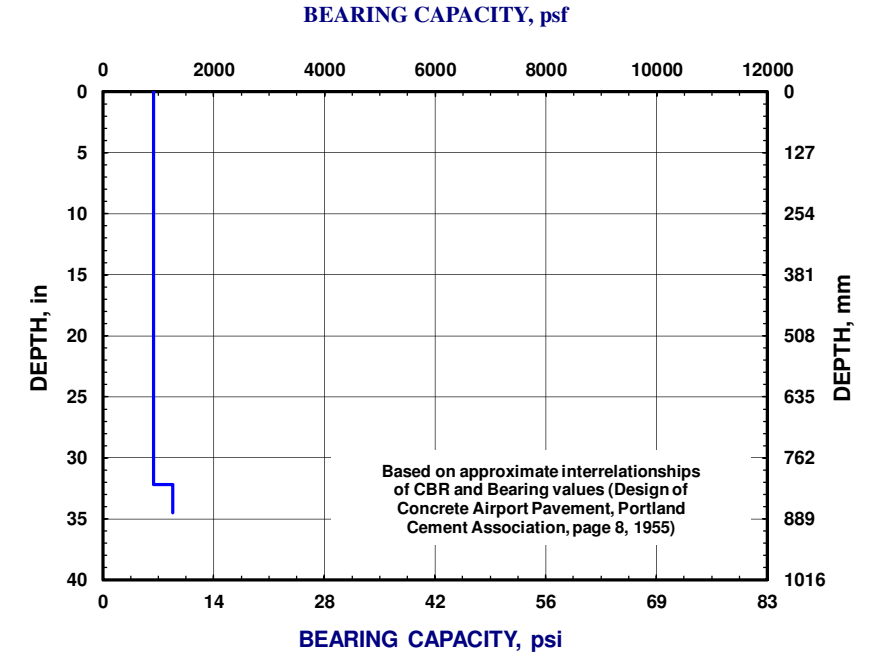
Location: K-5 **Soil Type(s):** SAND (SM)

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Cumulative Penetration (mm)	Type of Hammer
0	0	1
5	818	1
1	876	1





DCP TEST DATA

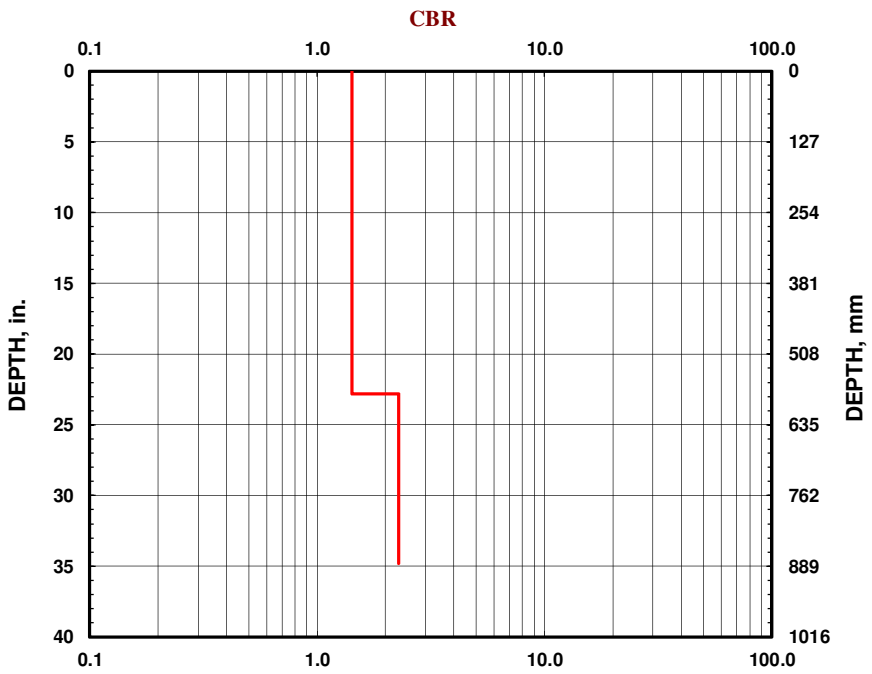
Project: New Folkstone Elementary School **Date:** 8-Mar-19

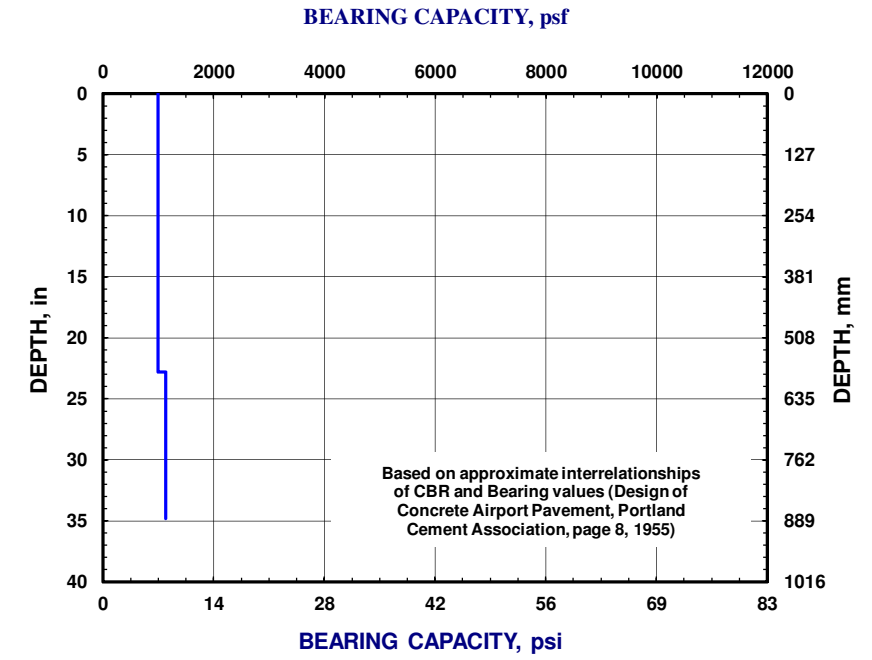
Location: K-6 **Soil Type(s):** SAND (SM)

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Cumulative Penetration (mm)	Type of Hammer
0	0	1
5	579	1
4	884	1





DCP TEST DATA

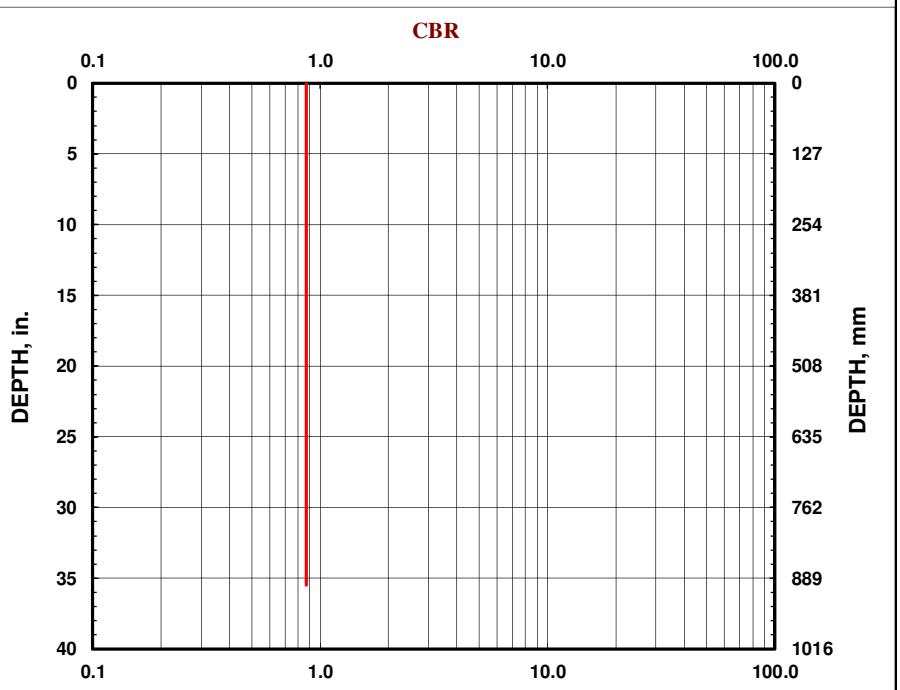
Project: New Folkstone Elementary School **Date:** 8-Mar-19

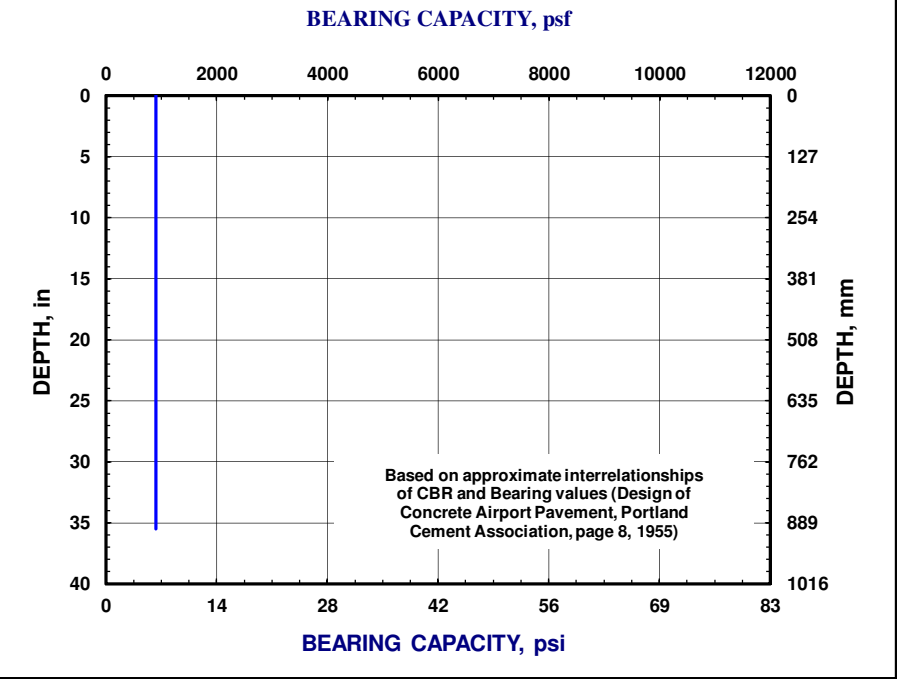
Location: K-7 **Soil Type(s):** SAND (SM)

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Cumulative Penetration (mm)	Type of Hammer
0	0	1
5	902	1





DCP TEST DATA

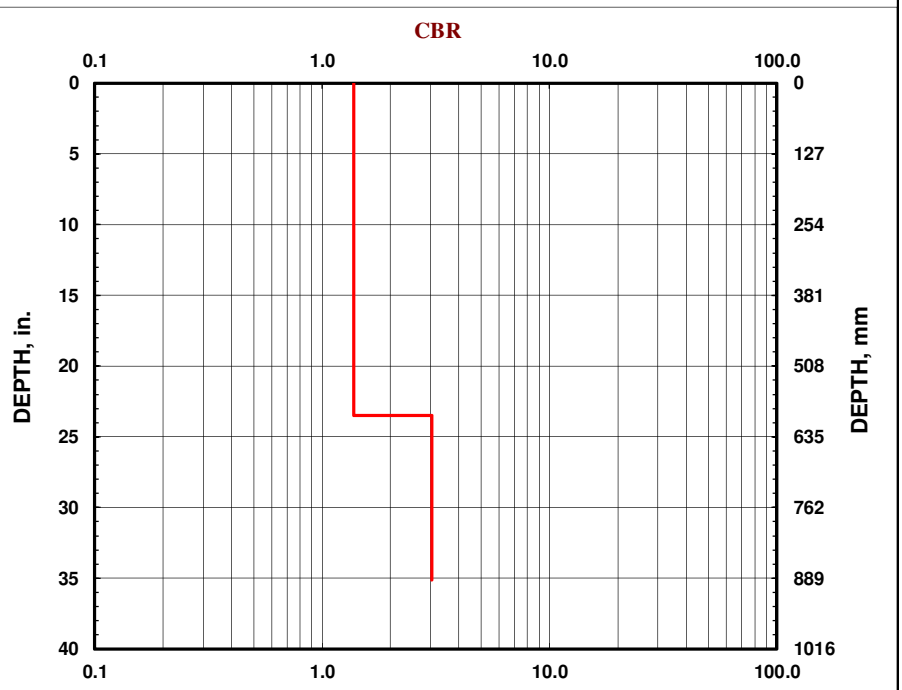
Project: New Folkstone Elementary School **Date:** 8-Mar-19

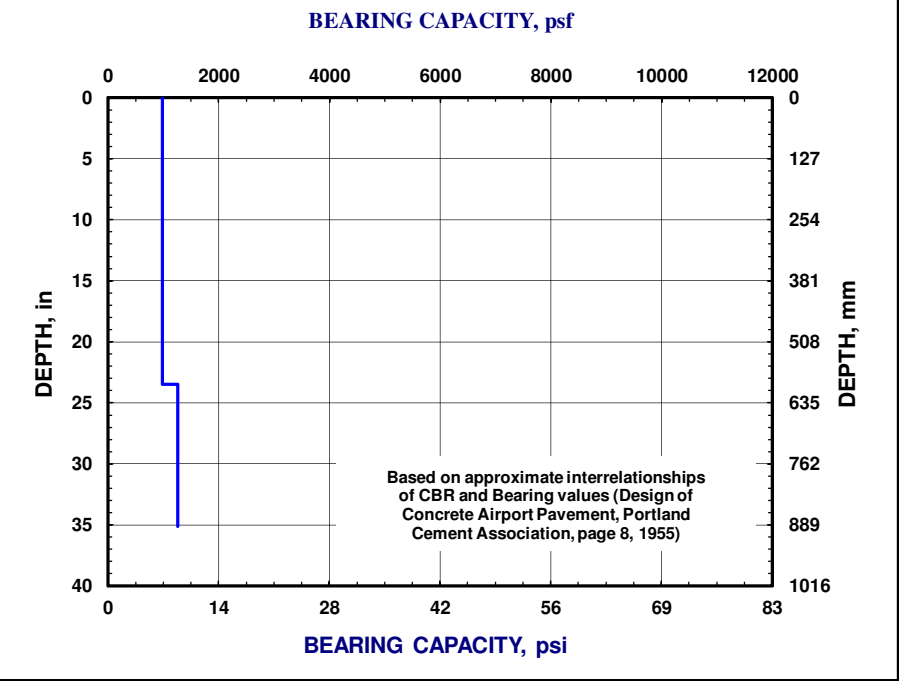
Location: K-8 **Soil Type(s):** SAND (SM)

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Cumulative Penetration (mm)	Type of Hammer
0	0	1
5	597	1
5	892	1





DCP TEST DATA

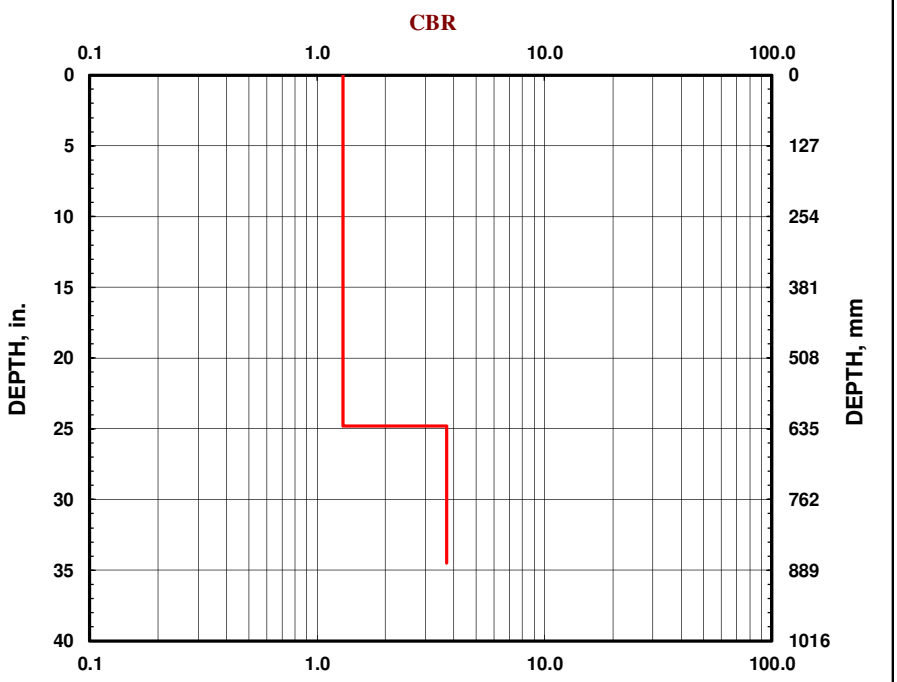
Project: New Folkstone Elementary School **Date:** 8-Mar-19

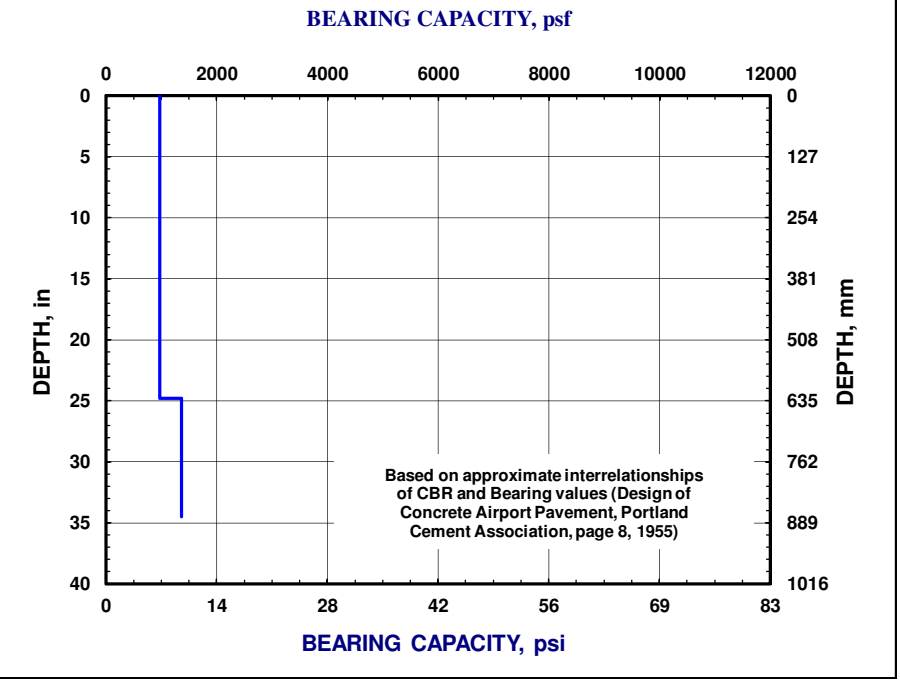
Location: K-9 **Soil Type(s):** SAND (SM)

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Cumulative Penetration (mm)	Type of Hammer
0	0	1
5	630	1
5	876	1

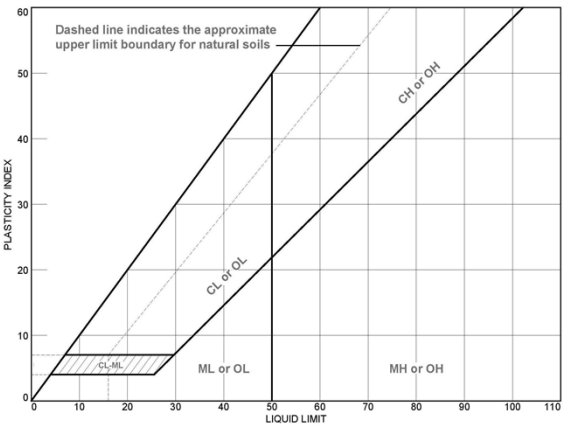




Unified Soil Classification System
(ASTM Designation D-2487)

Major Division			Group Symbol	Typical Names	Classification on basis of percentage of fines	Classification Criteria
Coarse-grained soils More than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve		GW	Well-graded gravels and gravel-sand mixtures, little or no fines	Less than 5% Pass No. 200 sieve More than 12% Pass No. 200 sieve 5% to 12% Pass No. 200 sieve Borderline classification requiring use of dual symbol GW, GP, SW, SP GM, GC, SM, SC	$C_u = D_{60}/D_{10}$ Greater than 4 $C_z = (D_{30})^2/(D_{10}xD_{60})$ Between 1 and 3
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines		Not meeting both criteria for GW
			GM	Silty gravels, gravel-sand-silt mixtures		Atterberg limits plot below "A" line or plasticity index less than 4
			GC	Clayey gravels, gravel-sand-clay mixtures		Atterberg limits plot above "A" line and plasticity index greater than 7
	Sands More than 50% of coarse fraction passes No. 4 sieve		SW	Well-graded sands and gravelly sands, little or no fines		$C_u = D_{60}/D_{10}$ Greater than 6 $C_z = (D_{30})^2/(D_{10}xD_{60})$ Between 1 and 3
			SP	Poorly graded sands and gravelly sands, little or no fines		Not meeting both criteria for SW
			SM	Silty sands, sand-silt mixtures		Atterberg limits plot below "A" line or plasticity index less than 4
			SC	Clayey sands, sand-clay mixtures		Atterberg limits plot above "A" line and plasticity index greater than 7
Fine-grained soils 50% or more passing No. 200 sieve	Silts and Clays Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands		
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
			OL	Organic silts and organic silty clays of low plasticity		
	Silts and Clays Liquid limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts		
			CH	Inorganic clays of high plasticitiy, fat clays		
			OH	Organic clays of medium to high plasticity		
Highly organic soils			Pt	Peat, muck and other highly organic soils		Fibrous organic matter; will char, burn, or glow

Note: U-line represents approximate upper limit of LL and PI combinations for natural soils (empirically determined). ASTM-D2487.



Plasticity chart for the classification of fine-grained soils. Tests made on fraction finer than No. 40 sieve

UNIFIED SOIL CLASSIFICATION SYSTEM

CLIENT	Job #:	BORING #	SHEET
Onslow County Schools	22:27624	K-1	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
New Folkstone Elementary School	Pinnacle Architecture, P.A.

SITE LOCATION

Stump Sound Township, Onslow County, NC

NORTHING	EASTING	STATION

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION

SURFACE ELEVATION 32

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0						32	
1					▽	31	
2						30	
3						29	
4						28	
5						27	
6						26	

TOPSOIL/ROOTMAT [12"]

(SM) SILTY FINE TO MEDIUM SAND, dark gray/dark brown, wet to saturated

(SC) CLAYEY FINE SAND, dark gray, saturated, no recovery from 2.5' to 3'

HAND AUGER REFUSAL @ 3'

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

▽ WL 1.0 WS ☐ WD ☐	BORING STARTED 3/08/19	CAVE IN DEPTH 2.0
▽ WL(SHW) ▼ WL(ACR)	BORING COMPLETED 3/08/19	HAMMER TYPE
▽ WL	RIG FOREMAN	DRILLING METHOD Hand Auger

CLIENT	Job #:	BORING #	SHEET
Onslow County Schools	22:27624	K-2	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
New Folkstone Elementary School	Pinnacle Architecture, P.A.

SITE LOCATION

Stump Sound Township, Onslow County, NC

NORTHING	EASTING	STATION

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% — WATER CONTENT% — LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION

SURFACE ELEVATION 32

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0						32	
TOPSOIL/ROOTMAT [6"]							
1						31	
(SM) SILTY FINE TO MEDIUM SAND, dark gray/dark brown, wet to saturated, trace roots, no recovery from 2' to 3'							
2						30	
3						29	
HAND AUGER REFUSAL @ 3.5'							
4						28	
5						27	
6						26	

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 1.0 WS☐ WD☐	BORING STARTED 3/08/19	CAVE IN DEPTH 1.5
WL(SHW) WL(ACR)	BORING COMPLETED 3/08/19	HAMMER TYPE
WL	RIG FOREMAN	DRILLING METHOD Hand Auger

CLIENT	Job #:	BORING #	SHEET
Onslow County Schools	22:27624	K-3	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
New Folkstone Elementary School	Pinnacle Architecture, P.A.

SITE LOCATION

Stump Sound Township, Onslow County, NC

NORTHING	EASTING	STATION

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION

SURFACE ELEVATION 32

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0						32	
1						31	
2						30	
3						29	
4						28	
5						27	
6						26	

TOPSOIL/ROOTMAT [6"]

(SM) SILTY FINE SAND, dark gray/dark brown, wet to saturated

HAND AUGER REFUSAL @ 3'

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 0.5 WS ☐ WD ☐	BORING STARTED 3/08/19	CAVE IN DEPTH 1.5
WL(SHW) WL(ACR)	BORING COMPLETED 3/08/19	HAMMER TYPE
WL	RIG FOREMAN	DRILLING METHOD Hand Auger

CLIENT	Job #:	BORING #	SHEET
Onslow County Schools	22:27624	K-4	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
New Folkstone Elementary School	Pinnacle Architecture, P.A.

SITE LOCATION

Stump Sound Township, Onslow County, NC

NORTHING	EASTING	STATION

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION

SURFACE ELEVATION 32

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0						32	
1						31	
2						30	
3						29	
4						28	
5						27	
6						26	

TOPSOIL/ROOTMAT [5"]

(SM) SILTY FINE SAND, dark gray/dark brown, wet to saturated, trace roots and clay, no recovery from 2.5' to 3'

HAND AUGER REFUSAL @ 3'

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 0.1 WS☐ WD☐	BORING STARTED 3/08/19	CAVE IN DEPTH 1.5
WL(SHW) WL(ACR)	BORING COMPLETED 3/08/19	HAMMER TYPE
WL	RIG FOREMAN	DRILLING METHOD Hand Auger

CLIENT	Job #:	BORING #	SHEET
Onslow County Schools	22:27624	K-5	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
New Folkstone Elementary School	Pinnacle Architecture, P.A.

SITE LOCATION: Stump Sound Township, Onslow County, NC

NORTHING	EASTING	STATION

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION (100%)

SURFACE ELEVATION 32

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0						32	
1						31	
2						30	
3						29	
4						28	
5						27	
6						26	

0 TOPSOIL/ROOTMAT [10"]

1 (SM) SILTY FINE SAND, dark gray/dark brown, wet to saturated, trace roots and clay, no recovery from 3' to 4'

4 END OF BORING @ 4'

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 1.5 WS ☐ WD ☐	BORING STARTED 3/08/19	CAVE IN DEPTH 1.5
WL(SHW) WL(ACR)	BORING COMPLETED 3/08/19	HAMMER TYPE
WL	RIG FOREMAN	DRILLING METHOD Hand Auger

CLIENT	Job #:	BORING #	SHEET
Onslow County Schools	22:27624	K-6	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
New Folkstone Elementary School	Pinnacle Architecture, P.A.

SITE LOCATION

Stump Sound Township, Onslow County, NC

NORTHING	EASTING	STATION

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION

SURFACE ELEVATION 32

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0						32	
1						31	
2						30	
3						29	
4						28	
5						27	
6						26	

TOPSOIL/ROOTMAT [12"]

(SM) SILTY FINE SAND, dark gray/dark brown, wet to saturated, trace roots, no recovery from 2.5' to 3'

HAND AUGER REFUSAL @ 3'

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 0.7 WS ☐ WD ☐	BORING STARTED 3/08/19	CAVE IN DEPTH 2.0
WL(SHW) WL(ACR)	BORING COMPLETED 3/08/19	HAMMER TYPE
WL	RIG FOREMAN	DRILLING METHOD Hand Auger

CLIENT	Job #:	BORING #	SHEET
Onslow County Schools	22:27624	K-7	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
New Folkstone Elementary School	Pinnacle Architecture, P.A.

SITE LOCATION

Stump Sound Township, Onslow County, NC

NORTHING	EASTING	STATION

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION

SURFACE ELEVATION 32

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0						32	
1						31	
2						30	
3						29	
4						28	
5						27	
6						26	

0 TOPSOIL/ROOTMAT [12"]

1 (SM) SILTY FINE SAND, dark gray/dark brown, wet to saturated, trace roots, no recovery from 2' to 3'

3 HAND AUGER REFUSAL @ 3'

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 0.5 WS☐ WD☐	BORING STARTED 3/08/19	CAVE IN DEPTH 1.3
WL(SHW) WL(ACR)	BORING COMPLETED 3/08/19	HAMMER TYPE
WL	RIG FOREMAN	DRILLING METHOD Hand Auger

CLIENT	Job #:	BORING #	SHEET
Onslow County Schools	22:27624	K-8	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
New Folkstone Elementary School	Pinnacle Architecture, P.A.

SITE LOCATION

Stump Sound Township, Onslow County, NC

NORTHING	EASTING	STATION

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION

SURFACE ELEVATION 32

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0						32	
1						31	
2						30	
3						29	
4						28	
5						27	
6						26	

TOPSOIL/ROOTMAT [10"]

(SM) SILTY FINE SAND, dark gray/dark brown, wet to saturated, trace roots, no recovery from 2' to 3'

HAND AUGER REFUSAL @ 3'

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 0.8 WS ☐ WD ☐	BORING STARTED 3/08/19	CAVE IN DEPTH 1.7
WL(SHW) WL(ACR)	BORING COMPLETED 3/08/19	HAMMER TYPE
WL	RIG FOREMAN	DRILLING METHOD Hand Auger

CLIENT	Job #:	BORING #	SHEET
Onslow County Schools	22:27624	K-9	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
New Folkstone Elementary School	Pinnacle Architecture, P.A.

SITE LOCATION

Stump Sound Township, Onslow County, NC

NORTHING	EASTING	STATION

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% — WATER CONTENT% — LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION

SURFACE ELEVATION 32

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0						32	
1						31	
2						30	
3						29	
4						28	
5						27	
6						26	

TOPSOIL/ROOTMAT [12"]

(SM) SILTY FINE SAND, dark gray/dark brown, wet to saturated, trace roots, no recovery from 3' to 3.5'

HAND AUGER REFUSAL @ 3.5'

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 0.3 WS☐ WD☐	BORING STARTED 3/08/19	CAVE IN DEPTH 1.5
WL(SHW) WL(ACR)	BORING COMPLETED 3/08/19	HAMMER TYPE
WL	RIG FOREMAN	DRILLING METHOD Hand Auger

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APPENDIX C – Supplemental Report Documents

GBA Document

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled*. No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed*. The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

DIVISION 03

SECTION 03 10 00: CONCRETE FORMS AND ACCESSORIES

03 10 00.01: GENERAL

A. SCOPE

1. Furnish all labor, materials and equipment necessary to complete all concrete formwork as required by the drawings and specified herein.

B. INDUSTRY STANDARDS

1. Some products and execution are specified in this Section by reference to published specifications or standards of the following (with respective abbreviations used):

   a. American Concrete Institute (ACI).
   b. The American Society for Testing and Materials (ASTM).
   c. U.S. Product Standards (PS).

03 10 00.02: PRODUCTS

A. EARTH FORMS FOR TRENCH EXCAVATION

1. Where trench excavation is used and walls of excavation are neatly cut in good soil, side forms may be omitted for footings.

B. FORM MATERIAL

1. Plywood: Formwork for all concrete, unless otherwise specified, shall not be less than 5/8", 5-ply Douglas fir plywood especially processed to resist moisture and conforming to Plywood Class I, B-B-Ext-DFPA of U.S. Product Standard PS 1-66, as made by a member of the American Plywood Association.

C. ACCESSORIES

1. Form ties where concrete is unexposed shall be standard crimped snap ties. Form ties where concrete is exposed as finish shall be form clamps used with smooth tie rods. Form ties where concrete is exposed as finish shall be form clamps used with smooth tie rods. Form ties shall be as manufactured by Meadow Steel Products Company, Gateway Erectors, Inc. or Universal Form Clamp Company.

2. Corner formers shall be plastic with 1/2" radius equal to "Green Streak" corner formers, manufactured by Greenstreak Group, Inc., St. Louis, MO. 1-800-325-9504, B.F. Goodrich Company or Vinylex Corporation.

3. Form releasing agent shall be non-staining "Form Oil" as manufactured by Texaco, Sinclair or Georgia Carolina Company.

03 10 00.03: EXECUTION

A. FORM CONSTRUCTION

1. Forms shall conform to shape, lines, and dimensions of members indicated, and shall be substantial and sufficiently tight to prevent leakage of grout. Forms shall be properly braced or tied together so as to maintain position and shape. Construct forms so that they can be removed readily without hammering or prying against the concrete. Forms for exposed concrete shall be carefully made and accurately placed to obtain correct shape and lines.

2. Contractor shall be fully responsible for adequacy of form in its entirety. Forms shall support loads they will be required to sustain and shall maintain their dimensional and surface correctness to produce members required by drawings.

3. Box out for slots, chases, recesses, or other openings as shown on drawings or as needed for the work of any other trades.

4. Build bulkheads with keys in walls, footings and slabs where it is necessary to stop pouring of concrete. See Section 3C for construction joints.

5. Box out for all temporary openings and build forms to seal them up as required.

6. All formwork shall be constructed in accordance with ACI 347.

B. REUSED FORMS

1. Reused forms shall be thoroughly cleaned of dirt, debris, concrete, and foreign matter. Forms shall not be reused if they have developed defects which would affect their tightness and strength. Used forms shall not be used for architectural concrete.

C. WOOD FORMS

1. Wood forms shall be made of plywood. Joints shall be butted tight on solid bearings. Arrangements of panels shall be orderly and symmetrical, and use of small pieces shall be avoided. Forms shall be chamfered for external corners of concrete which will be exposed in finished work.

D. APPLICATION OF FORM COATING

1. Immediately before the placing of reinforcing, faces of all forms in contact with the concrete shall receive a thorough coating of the liquid form of releasing agent specified, applied in compliance with the manufacturer's instructions.

E. GUARANTEE

1. Form Release Coatings: Submit a written guarantee signed by the coating manufacturer that the coating will not stain the concrete, will not impair the natural bonding character of paints, plasters, or their concrete coatings, will not damage the surface texture of the concrete, nor impair the strength of the concrete.

F. REMOVAL OF FORMS

1. Contractor shall assume full responsibility for removal of formwork. Forms shall be removed in accordance with the requirements of ACI 318 without damage to concrete, and in such manner as to insure complete safety of structure.

2. Under ordinary weather conditions, wall forms and other vertical forms for concrete which do not span between definite supports may be removed after two days.

DIVISION 03

SECTION 03 20 00: CONCRETE REINFORCEMENT

03 20 00.01: GENERAL

A. SCOPE

1. Furnish all labor, materials and equipment necessary to complete all concrete reinforcement as indicated on the drawings and specified herein.

B. INDUSTRY STANDARDS

1. Some products and execution are specified in the Section by reference to published specifications or standards of the following (with respective abbreviations used):

   a. American Concrete Institute (ACI).
   b. The American Society for Testing and Materials (ASTM).

2. The current edition of the following standard references shall apply to the work of this Section:

ASTM A82	Specification for Cold Drawn Steel Wire for Concrete Reinforcement.
ASTM A185	Specification for Welded Steel Wire Fabric for Concrete Reinforcement.
ASTM A615	Specification for Deformed Billet Steel Bars for Concrete Reinforcement.
ACI 315	Manual of Standard Practice for Detailing Reinforced Concrete Structures.
ACI 318	Building Code Requirements for Reinforced Concrete.
AWS D1.4	Structural Welding Code. Reinforcing Steel.

C. SUBMITTALS

1. Submit for approval shop drawings showing placing plans, bending details, and bar lists. All details and notes appearing on the Contract Drawings, and giving information for the placing of reinforcing steel, shall be shown also on the shop drawings. Shop drawings will not be approved without such information, and be of the same general form, as those on the contract drawings. Wall reinforcing shall be shown in elevation. Location and arrangement of accessories shall be clearly indicated. Only shop drawings completely checked by stamped, signed and dated by Contractor will be considered by the Architect.

2. Mill tests of reinforcing steel shall be submitted for each 15 tons, or less, shipped to the job site. Tests shall be conducted in conformance with ASTM A615, and methods prescribed therein. Cost of tests shall be borne by Contractor. Three (3) copies of each test report shall be submitted to the Architect.

D. STORAGE OF MATERIALS

1. Reinforcing steel delivered to the job, and not immediately placed in forms, shall be protected from mud, excessive rust producing conditions, oil, grease, or distortion.

E. INSPECTION OF STEEL PLACEMENT

1. The Architect shall have 24 hours notice and the opportunity to inspect and pass upon the placement of reinforcing steel before each concrete pour. Such inspections are in the nature of assisting the Contractor to minimize errors, and in no case will they operate to relieve the Contractor of this responsibility to provide the materials and workmanship required by the Contract Documents.

03 20 00.02: PRODUCTS

A. REINFORCING BARS

1. Metal reinforcement shall be deformed type bars conforming to ASTM A615 Grade 60. Reinforcement shall be manufactured from new billet steel of American manufacture, and shall conform to ASTM A615. All reinforcing shall be clean and free from loose rust, scale or other coatings that will reduce bond.

B. WELDED WIRE FABRIC

1. Welded wire fabric, or cold-drawn wire for concrete reinforcement shall conform to the requirements of ASTM A185 or ASTM A82, respectively. Size and gauge shall be as indicated on drawings with a minimum of 6 x 6 - W1.4xW1.4.

2. Lap sides and ends a minimum of 6". As concrete is deposited, carefully lift the mesh to the position indicated or noted on the drawings. Use steel mesh around steel to be fireproofed so it is 3/4" to 1" from flat surface of column or beam flanges. All to be as ASTM A-A 185-61T.

C. SHOP FABRICATION

1. Reinforcing steel shall be fabricated to shapes and dimensions indicated on the drawings and in compliance with applicable provisions of ACI 315 and ACI 318. Bars shall be bent cold in the Shop, and no bars shall be bent in the field.

03 20 00.03: EXECUTION

A. PLACEMENT AND ANCHORAGE

1. Space metal chairs, spacers and hangers in accordance with ACI 315 and ACI 318.

2. Metal reinforcement, at the time concrete is placed, shall be free from mud, oil, grease, rust, scale or other coatings that will destroy or reduce bond. Bars with kinks or bends not shown on the plans shall not be used.

   a. Metal reinforcement shall be placed in the exact position as shown on the plans and held securely during the placing of the concrete. In general, all reinforcement shall be placed and securely wired at each intersection with not less than 16 gauge annealed wire or approved clips and blocked before placing concrete in any section. All abrupt bends shall be avoided except where one member is bent around another. All reinforcing shall be securely blocked away from the forms by means of approved devices. Brick or clay tile may be used to support reinforcement in footings on ground.

All metal supports used for this purpose adjacent to forms are to be galvanized, or as noted in other parts of this specification.

b. No concrete shall be deposited until the Architect has inspected the placing of the reinforcement and given permission to place concrete. All concrete placed in violation of this provision shall be rejected and removed. Reinforcement must not be displaced from its correct position during or before the placing of concrete.

c. There will be absolutely no changes, rearrangement nor deviation from the drawings. Indifference and carelessness will not be tolerated and any workman, foreman, or superintendent displaying that attitude will be immediately removed from the job.

3. Steel reinforcement dowels for successive work (walls, columns, and similar items) shall be wired in the correct position before placing concrete. The "sticking" of dowels into concrete after placement will not be permitted.

4. Masonry Reinforcement: All masonry walls shall be reinforced with flush masonry reinforcing. Masonry metal reinforcing material shall be used every alternate course, beginning with the first course. Width of reinforcement to be 2" less the thickness of wall as shown on the drawings. Corner starter units shall be used on all corners. Partition "T" shall be used every alternate course, at all intersections of interior bearing and non-bearing partitions. Metal reinforcing shall be installed in at least two consecutive courses above and below all wall openings, with reinforcement extending a minimum of 32" beyond opening on each side. Finish shall be hot dipped galvanized after fabrication. All masonry metal reinforcing for bearing walls (8" and 12") shall be "Heavy Duty". That for non-bearing walls (4") shall be "Standard".

B. CONCRETE COVER

1. Metal reinforcement shall be protected by concrete cover. Where not otherwise shown on drawings, the thickness of concrete over reinforcement shall be as follows:

a.	Walls	2" clear to surface exposed to weather; 1-1/2" clear to interior surfaces.
b.	Slabs	1" clear to top and bottom.
c.	Footings	3" clear to sides and bottom.
d.	Beams	1-1/2" clear to stirrups.

C. SPLICING

1. Splicing of reinforcement not shown on drawings, or as specified in this paragraph, shall not be done except in specific instances previously approved by the Architect. Splices shall not be made at point of maximum stress and shall provide sufficient lap to transfer stress between bars by bond. Minimum lap of all bars shall be 30 diameters, or as indicated on the drawings. All splices shall be in accordance with ACI 315.

DIVISION 03

SECTION 03 30 00: CAST-IN-PLACE CONCRETE

03 30 00.01: GENERAL

A. RELATED DOCUMENTS

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. SUMMARY

1. This Section specifies cast-in-place concrete, including reinforcement, concrete materials, mixture design, placement procedures, and finishes.

2. Related Sections include the following:

   a. Division 31 Section "Earth Moving" for drainage fill under slabs-on-grade.
   b. Division 32 Section "Cement Concrete Pavement" for concrete pavement and walks.

C. SUBMITTALS

1. General: In addition to the following, comply with submittal requirements in ACI 301.

2. Product Data: For each type of product indicated.

3. Design Mixtures: For each concrete mixture.

D. QUALITY ASSURANCE

1. 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.

2. Source Limitations: Obtain each type of cement of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

3. Comply with ACI 301, "Specification for Structural Concrete," including the following sections, unless modified by requirements in the Contract Documents:

   a. "General Requirements."
   b. "Formwork and Formwork Accessories."
   c. "Reinforcement and Reinforcement Supports."
   d. "Concrete Mixtures."
   e. "Handling, Placing, and Constructing. "Delete subparagraph below if no structural lightweight concrete is required.
   f. "Lightweight Concrete."

4. Comply with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

03 30 00.02: PRODUCTS

A. FORMWORK

1. Furnish formwork and formwork accessories according to ACI 301.

B. STEEL REINFORCEMENT

1. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

2. Plain-Steel Wire: ASTM A 82, as drawn.

3. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

C. CONCRETE MATERIALS

1. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout Project:

   a. Portland Cement: ASTM C 150, Type I/II. Supplement with following:

      1) Fly Ash: ASTM C 618, Class [C] [F].
      2) Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

2. Normal-Weight Aggregate: ASTM C 33, graded, 3/4-inch (38-mm) nominal maximum aggregate size.

3. Lightweight Aggregate: ASTM C 330, 3/4-inch (25-mm) nominal maximum aggregate size.

4. Water: ASTM C 94/C 94M [potable].

D. ADMIXTURES

1. Air-Entraining Admixture: ASTM C 260.

2. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

   a. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
   b. Retarding Admixture: ASTM C 494/C 494M, Type B.
   c. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
   d. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
   e. High-Range, Water-Reducing and Retarding Admixture: ASTMC 494/C 494M, Type G.
   f. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

E. RELATED MATERIALS

1. Vapor Barrier: ASTM E 1745, Class A, prime, virgin resin polyolefin sheet.

   a. Properties:

      1) New Material Permeance: less than 0.01 perms.
      2) After Conditioning Permeance (ASTM E 1745 Section 7.1): less than 0.01 perms.
      3) Thickness of Barrier: not less than 15 mils.

   b. Manufacturers:

      1) Stego Wrap, (877) 464-7834 or approved manufacturer.

   c. Seam Tape and Penetration Tape:

      1) Manufacturer's recommendation tape.

F. CURING MATERIALS

1. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

2. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

3. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

4. Water: Potable.

5. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

G. CONCRETE MIXTURES

1. Comply with ACI 301 requirements for concrete mixtures.

2. Normal-Weight Concrete: Prepare design mixes, proportioned according to ACI 301, as follows:

   a. Minimum Compressive Strength: 3000 psi (20.7 MPa) at 28 days.
   b. Maximum Water-Cementitious Materials Ratio: 0.45.
   c. Slump Limit: 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.
   d. Air Content: Maintain within range permitted by ACI 301. Do not allow air content of floor slabs to receive troweled finishes to exceed 3 percent.

3. Structural Lightweight Concrete Mix: ASTM C 330, proportioned to produce concrete with a minimum compressive strength of 3000 psi (20.7 MPa) at 28 days and a calculated equilibrium unit weight of 112 lb/cu. ft. plus or minus 3 lb/cu. ft., as determined by ASTM C 567. Concrete slump at point of placement shall be the minimum necessary for efficient mixing, placing, and finishing.

   a. Limit slump to 5 inches (125 mm) for troweled slabs and 4 inches (100 mm) for other slabs.

H. CONCRETE MIXING

1. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

   a. When air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

2. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

   a. For mixer capacity of 1 cu. yd. (0.76 cu. m) 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.
   b. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
   c. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

03 30 00.03: EXECUTION

A. FORMWORK

1. Design, construct, erect, brace, and maintain formwork according to ACI 301.

B. VAPOR RETARDERS

1. Install, protect, and repair vapor retarders according to ASTM E 1643; place sheets in position with longest dimension parallel with direction of pour.

   a. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended adhesive or joint tape.

C. STEEL REINFORCEMENT

1. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

   a. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

D. JOINTS

1. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

2. Construction Joints: Locate and install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

3. 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:

a. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.

b. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-(3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

4. Isolation Joints: Install joint-filler strips at junctions with slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

a. Extend joint-fillers the full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

E. CONCRETE PLACEMENT

1. Comply with ACI 301 for measuring, batching, mixing, transporting, and placing concrete.

2. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

3. Do not add water to concrete during delivery, at Project site, or during placement.

4. Consolidate concrete with mechanical vibrating equipment.

F. FINISHING FORMED SURFACES

1. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding 1/2 inch (13 mm).

a. Apply to concrete surfaces not exposed to public view.

2. 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 defective areas. Remove fins and other projections exceeding 1/8 inch (3 mm).

a. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

3. Rubbed Finish: Apply the following rubbed finish, defined in ACI 301, to smooth-formed finished as-cast concrete where indicated:

a. Smooth-rubbed finish.

4. 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.

G. FINISHING UNFORMED SURFACES

1. General: Comply with ACI 302.1R for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

2. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.

   a. Do not further disturb surfaces before starting finishing operations.

3. Scratch Finish: Apply scratch finish to surfaces indicated and surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, Portland Cement terrazzo, and other bonded cementitious floor finishes, unless otherwise indicated.

4. Float Finish: Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, fluid-applied or direct-to-deck-applied membrane roofing, or sand-bed terrazzo.

5. Trowel Finish: Apply a hard trowel finish to surfaces indicated and to floor and slab 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.

6. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set methods. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.

7. Nonslip Broom Finish: Apply a nonslip broom finish to surfaces indicated and to exterior concrete platforms, steps, and ramps. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

H. CONCRETE PROTECTING AND CURING

1. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 301 for hot-weather protection during curing.

2. 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 (1 kg/sq. m 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.

3. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

4. Curing Methods: Cure formed and unformed concrete for at least seven days by one or a combination of the following methods:

   a. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

      1) Water.
      2) Continuous water-fog spray.
      3) Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

   b. 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 (300 mm), 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.

   c. 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.

   d. 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.

I. FIELD QUALITY CONTROL

1. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.

2. Tests: Perform according to ACI 301.

   a. Testing Frequency: One composite sample shall be obtained for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mix placed each day.

J. REPAIRS

1. Remove and replace concrete that does not comply with requirements in this Section.

DIVISION 03

SECTION 03 30 53: CONCRETE FINISHES

RELATED DOCUMENTS:

The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

03 30 53.01: GENERAL

A. DESCRIPTION OF WORK

1. Work shall consist of providing specified finishes to all Cast-In-Place concrete shown on the Drawings.

2. All structural concrete work shall be done in accordance with the applicable sections of ACI 301, Specifications for Structural Concrete for Buildings.

B. SUBMITTALS

1. Submit, in accordance with General Conditions, Manufacturer's printed instructions for application of all products specified.

03 30 53.02: PRODUCTS

A. MATERIALS

1. Fine Aggregate:

   a. ASTM C 33-71a, Fine aggregate, Natural sand.

2. Portland Cement:

   a. ASTM C 150-72, Type I, gray.

3. Water:

   a. Potable, free of chemicals affecting set of the cement.

4. Bonding Agent:

   a. Equal to INTRALOK by WR Meadows.

5. Curing Compound and Sealer:

   a. Equal to KUREZ DR VOX by The Euclid Chemical Company or 1100-CLEAR by WR Meadows.

6. Epoxy Bonding Compound:

   a. 100% solids, 100% reactive, suitable for use on dry or damp surfaces. One of following: "Euco Epoxy #452 by The Euclid Chemical Company or "Sikadur Hi-Mod" by Sika Chemical Corporation.

03 30 53.03: EXECUTION

A. CONDITION OF SURFACES

1. Surfaces to receive bonding grout containing the bonding admixture shall be structurally sound and clean of any material which reduces bonding.

B. PATCHING CONCRETE

1. Any concrete which is not formed as shown on the Drawings, or for any reason is out of alignment or level, or shows a defective surface, or shows defects which reduce the structural adequacy of a member or members, shall be considered as not conforming to the intent of these Specifications. Defective concrete work shall be removed from the project by the Contractor at his expense, unless the Architect grants permission to patch the defective area. Permission to patch any such areas shall not be considered a waiver of the Architect's right to require complete removal of the defective work if the patching does not, in his opinion, satisfactorily restore the quality and appearance of the surface, or if patching does not restore the structural adequacy for the member or members.

2. After removing forms, inspect all concrete surfaces. Patch any poor joints, voids, honeycomb, stone pockets, or other defective areas permitted by the Architect to be patched, and all tie holes. Where necessary, chip away defective areas to a depth of not less than 1", with the edges perpendicular to the surface. The areas to be patched and a space at least 6" wide entirely surrounding it shall be wetted to prevent absorption of water from the patching mortar. A grout of equal parts Portland cement and sand with a 50/50 mixture of the bonding admixture and water to produce a consistency of thick paint and shall then be well brushed into the surface, followed immediately by the patching mortar. The patching mortar shall be made of the same material (and of approximately the same proportions) as used for the concrete, except that the coarse aggregate shall be omitted. The mortar shall not be richer than 1 part cement to 3 parts sand. The amount of mixing water shall be as little as is consistent with the requirements of handling and placing. The mortar shall be re-tempered without the addition of water by allowing it to stand for a period of one (1) hour, during which time it shall be mixed occasionally to prevent setting.

3. Compact mortar thoroughly into place, and screed off so as to leave the patch slightly higher than the surrounding surface. Leave patch undisturbed for a period of 1 to 2 hours to permit initial shrinkage before final finishing. Finish patch in such a manner as to match adjoining surface. On exposed surface where unlined forms have been used, obtain the final finish by striking off the surface with a straight-edge spanning the patch, and held parallel to the direction of the form marks. All patches shall be cured in accordance with curing requirements for the surface in which the patch occurs. Keep patch moist for not less than three (3) days after installation.

4. Tie holes left by the withdrawal of rods, or the holes left by the removal of ends of ties shall be filled solidly with mortar after first being wet thoroughly. For holes passing entirely through a wall, a plunger-type grout gun shall be used to force the mortar through the wall, starting at the back face. A piece of burlap or canvas shall be held over the hole on the outside; and when the hole is completely filled, the

excess mortar shall be struck off with the cloth flush with the surface. Holes not passing entirely through the walls shall be filled with a small tool that will permit packing the hole solidly with mortar. Any excess mortar at the surface of the wall shall be struck off flush with a cloth.

5. All structural repairs shall be made with prior approval of the Engineer, as to method and procedure, using the specified epoxy adhesive and/or epoxy mortar.

C. FINISHES ON FORMED SURFACES

1. Upon completion of patching, surfaces of concrete shall be finished as follows:

a. Grout and Rubber Float Finish:

1) All exterior and interior concrete surfaces which will not be covered by other construction and which will be visible, shall receive a grout and rubber float finish.
2) Remove all fins and projections. Rub surface lightly with dry, coarse silicon carbide stone, with concrete dry. Use no water at this stage. Cure concrete for three more days.
3) Following cure, fog down surface until thoroughly saturated (2 to 6 hours). Apply grout consisting of 1 part Portland cement and 1-1/2 parts of fine sand with a 50/50 mixture of the bonding admixture and water to produce a consistency of thick paint. Apply grout uniformly with a brush, completely filling all air bubbles and holes.
4) Scour thoroughly with 80 grit silicon carbide stone or cork float. Do not add more water. After making surface uniform in color and texture, let stand until grout becomes tacky. Remove excess grout with rubber float. No tool marks shall be visible.
5) Cure for 48 hours with continuously wet burlap, or by continuous dampening with fog spray.

b. Common Finish:

1) Common finish shall be produced by filling smoothly all tie holes, honeycomb, and other depressions, knocking off and evening up burrs and form marks.
2) Common finish shall be confined to concrete surfaces which will be covered by other construction and which will not be visible.

D. UNFINISHED STRUCTURAL SLABS

1. Surfaces intended to receive cement setting bed or fill for other materials shall be screeded to true plane, and scraped free of laitance or scum immediately thereafter; and shall be roughened mechanically for bond as soon as they will bear the weight of workmen.

2. Surfaces to receive fill or cement setting beds shall be scrubbed thoroughly before placing fill or cement setting beds, and shall then have neat cement grout broomed onto the surface a short distance ahead of the fill.

E. MONOLITHIC CEMENT FINISH

1. Apply steel trowel finish to the surface of concrete floor slabs as follows: Place, consolidate, strike off and level concrete slab to proper elevation. After the concrete has stiffened sufficiently to permit the operation, and water sheen has disappeared, the surface shall be floated at least twice to a uniform sandy texture.

2. Trowel Finish: After floating, the surface shall then be troweled at least twice to a smooth dense finish and to an FL tolerance. Differences in elevation, between two points, shall not exceed 1/4" in 10 ft., Class B. In addition, floor surface shall not vary more than +/1 1/2" from the elevation noted on the drawings anywhere on the floor surface. Perform final troweling after concrete has hardened so that no mortar accumulates on the trowel and a ringing sound is produced as the trowel is drawn over the surface. No floating screeds allowed.

3. Concrete Grinding: (Contractor's Option) Contractor shall have the option of floating concrete slabs as specified above and grinding concrete floor to tolerance as described above. Contractor shall submit grinding equipment and methods to the Architect for approval prior to grinding. Grinding shall be done prior to stud placement.

4. Patching and Leveling of Concrete Floors: Slabs not meeting required tolerances shall be patched and leveled at no additional cost to the Owner.

F. CURING

1. Interior slabs with resilient tile, carpet, or left exposed, and all exterior slabs, sidewalks, curbs, etc. shall be cured with the specified clear curing and sealing compound.

2. Other interior slabs shall be cured with the specified dissipating resin type curing compound.

3. Curing compounds must be applied immediately after final finishing.

4. All formed vertical surfaces shall be cured with the specified curing/hardening compound when the forms are removed prior to the completion of the required curing period. Compound should be applied immediately after form removal; application shall be even to assure uniform appearance.

DIVISION 03

SECTION 03 45 00: PRECAST ARCHITECTURAL CONCRETE

03 45 00.01: GENERAL

A. SUMMARY

1. This Section includes the following:

   a. Architectural precast concrete cladding units.

B. DEFINITION

1. Design Reference Sample: Sample of approved architectural precast concrete color, finish and texture, preapproved by Architect.

C. PERFORMANCE REQUIREMENTS

1. Structural Performance: Provide architectural precast concrete units and connections capable of withstanding the following design loads within limits and under conditions indicated:

   a. Loads: As indicated on the Structural Drawings.

D. SUBMITTALS

1. Product Data: For each type of product indicated.

2. Design Mixtures: For each precast concrete mixture. Include compressive strength and water-absorption tests.

3. Shop Drawings: Detail fabrication and installation of architectural precast concrete units. Indicate locations, plans, elevations, dimensions, shapes, and cross sections of each unit. Indicate joints, reveals, and extent and location of each surface finish. Indicate details at building corners.

   a. Comprehensive engineering analysis signed and sealed by the qualified professional engineer responsible for its preparation. The Engineer shall be licensed in the state where Precast is to be installed. Show governing panel types, connections, and types of reinforcement, including special reinforcement. Indicate location, type, magnitude, and direction of loads imposed on the building structural frame from architectural precast concrete.

4. Samples: For each type of finish indicated on exposed surfaces of architectural precast concrete units, in sets of three (3), illustrating full range of finish, color, and texture variations expected; approximately 12 by 12 by 2 inches.

5. Welding certificates.

6. Material test reports: For aggregates.

7. Material Certificates: Signed by manufacturers.

E. QUALITY ASSURANCE

1. Fabricator Qualifications: A firm that assumes responsibility for engineering architectural precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

   a. Participates in PCI's plant certification program at time of bidding and is designated a PCI-certified plant for Group A, Category A1 - Architectural Cladding and Load Bearing Units.

2. Design Standards: Comply with ACI 318 and design recommendations of PCI MNL 120, "PCI Design Handbook - Precast and Pre-stressed Concrete," applicable to types of architectural precast concrete units indicated.

3. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."

4. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel"; and AWS D1.4, "Structural Welding Code - Reinforcing Steel."

5. Calculated Fire-Test-Response Characteristics: Where indicated, provide architectural precast concrete units whose fire resistance has been calculated according to ACI 216.1/TMS 0216.1, "Standard Method for Determining Fire Resistance of Concrete and Masonry Construction Assemblies," and is acceptable to authorities having jurisdiction.

6. Sample Panels: After sample approval and before fabricating architectural precast concrete units, produce a minimum of three (3) sample panels approximately 16 sq. ft. in area for review by Architect. Incorporate full-scale details of architectural features, finishes, textures, and transitions in sample panels.

03 45 00.02: PRODUCTS

A. REINFORCING MATERIALS

1. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

2. Low-Alloy-Steel Reinforcing Bars: ASTM A 706, deformed.

3. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from galvanized steel wire into flat sheets.

4. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

5. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 117.

6. Pre-stressing Strand: ASTM A 416, Grade 270, uncoated, 7-wire, low-relaxation strand.

    a. Coat unbonded post-tensioning strand with corrosion inhibitor passing ASTM D 1743 and sheath with polypropylene tendon sheathing. Include anchorage devices and coupler assemblies.

B. CONCRETE MATERIALS

1. Portland Cement: ASTM C 150, Type I or Type III, gray, unless otherwise indicated.

    a. For surfaces exposed to view in finished structure, mix gray with white cement, of same type, brand, and mill source.

2. Supplementary Cementitious Materials:

    a. Fly Ash: ASTM C 618, Class C or F, with maximum loss on ignition of 3 percent.
    b. Metakaolin Admixture: ASTM C 618, Class N.
    c. Silica Fume Admixture: ASTM C 1240, with optional chemical and physical requirement.
    d. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100.

3. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33, with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.

    a. Face-Mixture-Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.

        1) Gradation: To match design reference sample.

    b. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand of same material as coarse aggregate, unless otherwise approved by Architect.

4. Coloring Admixture: ASTM C 979, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, and non-fading.

5. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

6. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.

C. STEEL CONNECTION MATERIALS

1. Carbon-Steel Shapes and Plates: ASTM A 36.

2. Carbon-Steel Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished, AWS D1.1, Type A or B, with arc shields and with minimum mechanical properties of PCI MNL 117, Table 3.2.3.

3. Carbon-Steel Plate: ASTM A 283.

4. Malleable Iron Castings: ASTM A 47.

5. Carbon-Steel Castings: ASTM A 27, Grade 60-30.

6. High-Strength, Low-Alloy Structural Steel: ASTM A 572.

7. Carbon-Steel Structural Tubing: ASTM A 500, Grade B.

8. Wrought Carbon-Steel Bars: ASTM A 675, Grade 65.

9. Deformed-Steel Wire or Bar Anchors: ASTM A 496 or ASTM A 706.

10. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A; carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A 563; and flat, unhardened steel washers, ASTM F 844.

11. High-Strength Bolts and Nuts: ASTM A 325, Type 1, heavy hex steel structural bolts; heavy hex carbon-steel nuts, ASTM A 563; and hardened carbon-steel washers, ASTM F 436.

12. Zinc-Coated Finish: For exterior steel items steel in exterior walls and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123 or ASTM A 153.

    a. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.

13. Shop-Primed Finish: Prepare surfaces of nongalvanized steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3 and shop-apply lead- and chromate-free, rust-inhibitive primer, complying with performance requirements in MPI 79 according to SSPC-PA 1.

D. GROUT MATERIALS

1. Sand-Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144, or 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.

2. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, non-staining grout containing selected silica sands, Portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time.

3. Epoxy-Resin Grout: Two-component, mineral-filled epoxy resin; ASTM C 881, of type, grade, and class to suit requirements.

E. CONCRETE MIXTURES

1. Prepare design mixtures for each type of precast concrete required.

   a. Limit use of fly ash and silica fume to 20 percent of Portland cement by weight; limit metakaolin and silica fume to 10 percent of Portland cement by weight.

2. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at architectural precast concrete fabricator's option.

3. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 or PCI MNL 117 when tested according to ASTM C 1218.

4. Normal-Weight Concrete Mixtures: Proportion mixtures by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

   a. Compressive Strength (28 Days): 5000 psi minimum.

5. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to PCI MNL 117.

6. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.

7. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

F. FABRICATION

1. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during pre-casting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.

   a. Weld headed studs and deformed bar anchors used for anchorage according to AWS D1.1 and AWS C5.4, "Recommended Practices for Stud Welding."

2. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing architectural precast concrete units to supporting and adjacent construction.

3. Cast-in reglets, slots, holes, and other accessories in architectural precast concrete units as indicated on the Contract Drawings.

4. Reinforcement: Comply with recommendations in PCI MNL 117 for fabricating, placing, and supporting reinforcement.

5. Reinforce architectural precast concrete units to resist handling, transportation, and erection stresses.

6. Pre-stress tendons for architectural precast concrete units by either pre-tensioning or post-tensioning methods. Comply with PCI MNL 117.

7. Comply with requirements in PCI MNL 117 and requirements in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.

8. Place face mixture to a minimum thickness after consolidation of the greater of 1 inch or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover specified.

9. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units.

    a. Place backup concrete mixture to ensure bond with face-mixture concrete.

10. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air on surfaces. Use equipment and procedures complying with PCI MNL 117.

    a. Place self-consolidating concrete without vibration according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Pre-stressed Concrete Institute Member Plants."

11. Comply with PCI MNL 117 for hot- and cold-weather concrete placement.

12. Identify pickup points of architectural precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each architectural precast concrete unit on a surface that will not show in finished structure.

13. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.

14. Discard and replace architectural precast concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 117 and Architect's approval.

G. FABRICATION TOLERANCES

1. Fabricate architectural precast concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished panel complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.

H. FINISHES

1. Panel faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints shall be uniform, straight, and sharp. Finish exposed-face surfaces of architectural precast concrete units to match approved sample panels and as follows:

   a. Design Reference Sample: Refer to Drawings.
   b. PCI's "Architectural Precast Concrete - Color and Texture Selection Guide," of plate numbers indicated.
   c. As-Cast Surface Finish: Provide surfaces free of pockets, sand streaks, and honeycombs.
   d. Textured-Surface Finish: Impart by form liners or inserts to provide surfaces free of pockets, streaks, and honeycombs, with uniform color and texture.
   e. Bushhammer Finish: Use power or hand tools to remove matrix and fracture coarse aggregates.
   f. Exposed-Aggregate Finish: Use chemical retarding agents applied to concrete forms and washing and brushing procedures to expose aggregate and surrounding matrix surfaces after form removal.
   g. Abrasive-Blast Finish: Use abrasive grit, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces.
   h. Acid-Etched Finish: Use acid and hot-water solution, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces. Protect hardware, connections, and insulation from acid attach.
   i. Honed Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures.
   j. Polished Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures.
   k. Sand-Embedment Finish: Use selected stones placed in a sand bed in bottom of mold, with sand removed after curing.

2. Finish exposed top, bottom and/or back surfaces of architectural precast concrete units to match face-surface finish.

3. Finish unexposed surfaces of architectural precast concrete units by float finish.

I. SOURCE QUALITY CONTROL

1. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 117 requirements. If using self-consolidating concrete, also test and inspect according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Pre-stressed Concrete Institute Member Plants."

2. Owner will employ an independent testing agency to evaluate architectural precast concrete fabricator's quality-control and testing methods.

03 45 00.03: EXECUTION

A. INSTALLATION

1. Install clips, hangers, bearing pads, and other accessories required for connecting architectural precast concrete units to supporting members and backup materials.

2. Erect architectural precast concrete level, plumb, and square within specified allowable tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment as units are being permanently connected.

   a. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
   b. Unless otherwise indicated, provide for uniform joint widths of 3/4 inch.

3. Connect architectural precast concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.

4. Welding: Comply with applicable AWS D1.1 and AWS D1.4 for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.

5. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.

6. Grouting Connections: Grout connections where required or indicated. Retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.

7. Erect architectural precast concrete units level, plumb, square, true, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 117, Appendix I.

B. FIELD QUALITY CONTROL

1. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections and prepare reports:

   a. Erection of precast concrete members.

2. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.

3. Field welds will be subject to visual inspections and nondestructive testing according to ASTM E 165 or ASTM E 709. High-strength bolted connections will be subject to inspections.

4. Testing agency will report test results promptly and in writing to Contractor and Architect.

5. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.

6. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

C. REPAIRS

1. Repair damaged architectural precast concrete units if permitted by Architect. Methods and materials will be submitted to the Architect prior to repair. The Architect reserves the right to reject repaired units.

2. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet.

3. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780.

4. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.

D. CLEANING

1. Clean surfaces of precast concrete units exposed to view.

2. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.

3. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.

   a. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Clean soiled precast concrete surfaces with detergent and water, using stiff fiber brushes and sponges, and rinse with clean water. Protect other work from staining or damage due to cleaning operations.
   b. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

DIVISION 04

SECTION 04 20 00: UNIT MASONRY

04 20 00.01: GENERAL

A. SCOPE

1. The work covered by this section of the specifications consists of furnishing all labor, materials, equipment, appliances, scaffolding, etc., in connection with the complete installation, ready for use, of the items specified herein, in strict accordance with this section of the specifications, the general conditions, and the applicable drawings, notes and schedules.

2. Coordinate masonry work with other trades to expedite progress of all work. Provide holes, chases, slots, etc., as required for proper integration of work of other trades.

3. Execute all cutting and fitting required to fit masonry units around openings and to receive work of other trades. Cut exposed masonry units only with an approved type wet masonry saw.

4. Build in solidly all window and door frames. Leave caulking space around exterior frames.

5. Install flashing in masonry as work progresses, as shown on drawings and required for watertight construction. Do not damage flashing. Extend flashings full length of lintels and in no case less than eight inches (8″) beyond jambs of openings. Flashing to extend into mortar joints not more than one inch (1").

6. Carefully investigate and verify, in field, all dimensions, locations and conditions pertaining to "Masonry Work". Arrange work and furnish materials as required to suit field conditions.

B. SAMPLES

1. Samples of face brick, pavers and block meeting this specification and the supplemental sheets shall be submitted to the Architect for consideration. In a designated location on the site the Architect will instruct the manufacturers of the samples selected to lay up 40" x 72" panels for the approval of the Architect and the Owner. The Architect will provide the sample wall design upon request and submittal approval. The erection of panels of brick or block not selected by the Architect will not be permitted. Panels not selected shall be removed from the site in their entirety before orders are placed. New brick will be required to match existing.

04 20 00.02: MATERIALS

A. BRICK

1. Brick shall be utility, modular, etc. masonry units as stated and shown on the Construction Documents. Brick shall be shipped to site and stacked in such a manner as to prevent any damage to faces and edges; chipped or cracked brick and brick not conforming to requirements hereinafter specified will be rejected.

B. SOLID BRICK PAVERS

1. Brick pavers shall have a modular size, 2-1/4" x 3-5/8" x 7-5/8" unless stated otherwise. Brick shall be shipped to site and stacked in such a manner as to prevent any damage to faces and edges; shipped or cracked brick and brick not conforming to requirements hereinafter specified will be rejected. Brick used in exterior applications shall meet ASTM C62-Grade SW requirements.

C. CONCRETE UNIT (LIGHTWEIGHT)

1. ASTM C90, Grade N-2. Aggregates for concrete masonry units shall be Solite conforming to requirements of ASTM C331. A blend of aggregates shall be used for fine and coarse aggregates in concrete masonry units. All concrete masonry units used on project shall be manufactured in and obtained from same plant.

2. The units shall be steam cured for at least twenty (20) hours during which time the temperature shall have been at least 150 degrees F. for at least two (2) hours. All units shall be completely protected from the weather during and after delivery to site.

3. Units shall be sound, free of cracks, broken corners, broken edges, or other defects which may impair their strength, durability, or appearance when used as finished interior walls. Units shall be free of organic impurities (including Fly Ash or similar materials) that will cause rusting, staining or pop-outs and shall contain no combustible matter.

4. The units when delivered on the job shall be at least twenty-one (21) days old. The Contractor must furnish test reports from a commercial testing laboratory on at least five units showing pounds per square inch for gross area of 1000 pounds or more and an absorption of not more than fifteen (15) pounds per cubic foot of concrete on each 10,000 or less units.

5. At the completion of the job, the Contractor shall furnish a certificate from Underwriter's Laboratory, certifying that these units meet with their requirements. In lieu of the test reports as to strength and absorption, the Architect may approve statement of manufacturer that the blocks furnished meet the requirements where supported by tests from commercial laboratory made at least monthly.

6. The average percentage of moisture in the units at time of setting shall not exceed 65% of their total absorption.

7. Provide special units where required and lintel units poured with regular block mix to match other units. Lintel units shall be scored to match block joints.

8. The concrete block shall be received on site on pallets and shall be moved about on the job by an Architect approved manner.

9. Stalite Brand Aggregate blocks will be acceptable for this project if they meet or exceed these specifications.

D. GLASS BLOCKS

1. Glass blocks where shown on the drawings shall be partially evacuated hollow masonry units made of clear, colorless glass. The units shall be 8" x 8" x 4" thick and 8" x 4" x 4" thick. The pattern is to be equal to "Nubio/Wave" as manufactured by Seves.

2. Joint reinforcing will be of welded galvanized mesh. The head and jamb frames will be steel channels to support the blocks as shown on the drawings.

3. Mortar Color shall be white.

E. MASONRY WALL REINFORCING

1. Masonry wall reinforcing shall be provided in masonry walls as shown on drawings and specified below. Interrupt continuous reinforcing only at wall openings. Lap joints in reinforcing at least six inches (6″), and cut and bend reinforcing at corners as recommended by manufacturer, or provide special corner sections, to provide continuous bond. Wall reinforcing shall be hot dipped galvanized after fabrication.

   a. Brick or block composite walls shall be reinforced with Standard Dur-O- Wal® Truss reinforcement; space sixteen inches (16″) on center vertically. See structural drawings for additional reinforcement in certain walls. Reinforcement shall be manufactured to fit the thickness of the wall.
   b. Interior concrete block walls shall be reinforced with No. 8 Standard Dur-O-Wal® Truss reinforcement. Space sixteen inches (16″) on center vertically.

F. MATERIALS SUBJECT TO DETERIORATION

1. Protect from dampness and store in a manner affording ready access to inspection and identification of each shipment. Remove damaged or otherwise unsuitable materials from site immediately.

G. PORTLAND CEMENT

1. Portland cement shall conform to the standard Specifications of the ASTM C-150 Type I or Type III except where otherwise noted on the drawings. Portland cement shall be fresh and of a standard brand, name of which shall be submitted to the Architect for approval. White Portland cement shall be in conformity with U.S. Federal Specification SS-C-181, latest edition. Portland cement shall be fresh and of a standard brand, name of which shall be submitted to the Architect for approval.

H. MORTARS

1. In general, mortar for all uses shall be in accordance with the governing Building Code except as exceeded by the following requirements:

   a. All mortars shall be highly plastic with high water resistance.
   b. Cement-lime mortar: 1-part Portland cement, 1-part lime putty, and 6 parts sand. Carolina Giant prepared mix or equal may be used in lieu of the cement and lime provided it is mixed in strict accordance with the proportions recommended by the manufacturer.

2. Mixing Mortars:

a. All materials for mortars shall be measured by volume; sand and cement dry mixed, lime putty added, and then water added to bring the proper consistency for use. No mortars that have stood for more than one hour shall be used.
b. Contractor will use a power mortar mixer.

I. LIME

1. Lime shall be pressure hydrated lime. Lime shall be high calcium Type S conforming to ASTM C-207. Unhydrated oxides shall not exceed 8%. Composition of hydrated lime shall be such that when the lime is mixed with Portland cement in the proportions of one-part Portland cement to .21 parts hydrated lime by weight, the mixture shall give an autoclave expansion of not more than 0.5% when tested in accordance with ASTM Tentative test for autoclave expansion of Portland cement (ASTM C-151). Lime putty composed of Type N lime may be used provided the above characteristics are complied with.

J. SAND

1. Sand for masonry work, except concrete, shall be capable of developing 95% of the tensile strength of Ottawa sand. It shall not contain deleterious substances exceeding the following percentages: 0.25 of 1% coal and lignite, 1% of clay lumps, and 1% of shale, alkali, coated grains, or flaky particles. Sand shall be graded from coarse to fine, with fine grains predominating as follows:

a. For joints of average thickness, such as brick, 100% of sand shall pass through a #8 sieve and not more than 35% through a #50 sieve.

K. WATER

1. Water shall be clean and free of injurious deleterious material. Water shall be potable.

L. WATERPROOFING

1. See SECTION 07 10 00: DAMPPROOFING & WATERPROOFING.

04 20 00.03: INSTALLATION

A. GENERAL

1. Lay walls up plumb and straight with joints in alignment.

2. Masonry walls shall be erected with extreme care; surfaces to be exposed shall be carefully and uniformly tooled in the concave shape. No "overlapping" of tooled joints will be accepted.

3. Care shall be exercised at all times to ensure that masonry wall reinforcing is solidly bedded in mortar joints.

4. No masonry work shall be done when atmospheric temperature is below 40 degrees F. and falling or when freezing weather is predicted within the ensuing 24 hours. No antifreeze will be permitted.

5. All units shall be laid in a full mortar bed. All joints shall be completely filled with mortar or grout. Allow space for caulking joint at all door and window frames.

6. All cutting of brick or block required on the job shall be done accurately and neatly with a wet masonry saw. Cut edges shall be square and straight.

7. Weep holes for cavity walls shall be forty-eight inches (48") o.c. horizontally.

8. All intersecting and butting walls and partitions shall be bonded together by formed galvanized metal channels.

9. Provide control joints in all masonry walls at forty feet (40'-0") on center unless otherwise indicated on the drawings. In no case shall the control joints be more than forty-five feet (45'-0") on center. Control joints shall be formed using factory control joint blocks, providing a shear key. The joints are to be raked and caulked. The joints in exterior walls shall extend through the face brick or block and shall be waterproof. Exterior joints must be laid up, i.e. cut-in-place joints will not be accepted. Architect and GC to coordinate the location of the control joints before any masonry work begins.

10. All sash, door frames, and wood bucks in brick work shall be set in their proper location, plumb and level with anchors attached and bricked in. Rack back to receive caulking on exterior units.

11. The mason shall set all iron work furnished to him, which is to be built in conjunction with the masonry walls, such as lintels, etc.

12. Build in all grounds, and wood brick, where shown and/or noted. These are to be furnished by the carpenter.

13. Build in all metal flashings as shown on the drawings. Flashing except as noted, will be furnished by the Roofing Contractor, fabric flashing where shown will be applied by the General Contractor, who will furnish all fabric and mastic. See Section 11, part 5.

14. Exposed face brick work shall be laid with joints tooled or raked as noted on the drawings. Unless otherwise indicated on the drawings, or specified, mortar joints shall be approximately 3/8" wide to lay up in course heights as dimensioned. Special care shall be taken with the striking of joints so that the joints are completely filled, leaving a smooth, hard, compact surface. To obtain this, striking tool or trowel shall be used and the mortar shoved with force so as to pack the mortar tight against the brick. The jointing tool will be approved by the Architect. Be sure the mortar does not harden before striking. Bed joints will be filled and smoothed to an even uniformed bed.

15. Masonry must be stored on platforms to keep them from contact with the ground.

16. Lay up all brick patterns as shown and/or noted on the drawings. All brick not exposed shall be common brick.

17. On all foundation walls and at all starting courses or courses above continuous relieving angles, install a length of sash cord on twenty-four (24") centers as weeps, or leave vertical brick joints open on base course(s) or other approved method of weeping wall areas.

18. Masonry units shall not be wetted before laying and their moisture content shall not exceed that specified in moisture content.

19. Masonry shall be protected against freezing for at least 48 hours after being laid. Unless adequate precautions against freezing are taken, no masonry shall be laid when the temperature is below forty (40) degrees F. on a rising temperature, or below forty (40) degrees F. on a falling temperature, at the point where the work is in progress. The laying of masonry shall not proceed on frozen material.

B. BRICK

1. Brick shall be laid uniformly, one scaffold high at a time except as otherwise approved. Brickwork shall be carried up plumb, with face of walls laid to a line and bed joints level.

2. Carry walls up uniformly, with no difference greater than ten (10') being permitted. Walls shall be toothed. No masonry shall be erected when the temperature is below 40 degrees F. on a rising temperature or below 40 degrees F. on a falling temperature, or when there is no probability of such a condition existing within 48 hours. No frozen work shall be built upon. No brick or other units having a film of water or frost on their surface shall be laid in the walls. No mortar mixed for more than one hour will be permitted to be used. Power mixer shall be used. All unfinished courses being worked on at quitting time shall be protected against the elements by suitable coverings. The brick mason shall work in conjunction with concrete contractor and wherever slabs bear on walls, the outside brickwork shall be carried into courses higher than the slab. Furnish and build in all nailing block as required. Build in all chases required for pipes, conduits, etc.

3. Each brick shall be laid in a full bed of mortar, and ample mortar for head joints shall be placed on end of each unit to ensure that cross joints will be completely filled, without slushing, when units are shoved into place.

4. All modular brick shall be laid up with uniform joints approximately 3/8-inch-thick as necessary to make 3 courses equal 8 inches; utility brick, 2 courses equal 8 inches. Exposed brick joints shall be cut flush, and after mortar takes its initial set shall be tooled as approved by Architect.

5. Line twigs shall be placed not greater than twenty feet (20') apart. Face brick bond shall be laid out dry on the foundation wall and adjusted before starting work.

C. SOLID BRICK PAVERS

1. General Note:

   a. Installation for an exterior pedestrian surface only.

2. Rough Grading:

   a. Live roots found in specific work areas may be removed or, if this is not desirable, change height or alignment of paving to avoid cutting main roots. Before any roots are cut, or height alignment changed, the Architect shall be informed. The intent is to save all trees.
   b. Any filled material placed in the subgrade will be tamped to avoid a future settlement.
   c. All underground drain lines, electrical conduits, etc. should be installed at this time, with ditches being well tamped as they are backfilled.

3. Fine Grading:

   a. Earth subgrade level shall be a minimum of 4" below finish grade.
   b. Entire grade area shall be tamped to assure ideal compaction.

4. Base Material:

   a. A minimum of 1-3/4" of stone screening (or sand) mixed with Portland cement and spread uniformly over area. Moisten screenings and thoroughly compact with hand or mechanical equipment. Re-screed as required to smooth base and bring to exact grade.
   b. Asphalt impregnated building felt or polyethylene sheeting shall be installed over finish base before brick is installed.

D. CONCRETE MASONRY UNITS

1. Bed concrete blocks solidly along face shells and webs and butter vertical joints their entire length. Make joints approximately 3/8-inch-thick as necessary to make each course equal 8 inches.

2. Where concrete blocks are exposed on the interior as finished wall, only full blocks shall be used, except where coursing at door and window jambs is broken. In all cases coursing shall be laid out so that no less than 1/2 block will be used. Half-height blocks are used where detailed on exterior and interior walls. All joints shall be cut flush and after the mortar has taken its initial set all horizontal joints shall be tooled to give a concave joint and fully compacted surface. All vertical joints shall remain flush. The masons shall leave all chases and openings required by other trades, but it will be the responsibility of these other trades to indicate to this Contractor the size and location of such chases.

   The masons shall also build in all anchors indicated, required or furnished to them by other trades or sub-contractors to provide for the installation of their work. Fill spaces around metal door frames and other built-ins solidly with mortar. Care shall be taken to protect aluminum door and window frames which are set before masonry work is completed.

3. At all exposed corners (270 degrees), the block shall have bullnosed corners with 1-1/2" radius. This note applies to door and window jambs also.

E. GLASS BLOCK

1. All necessary materials and all installation methods will be in accordance with the block manufacturer's applications manuals and instructions.

F. MASONRY BOND AND REINFORCING

1. Face Brick. Walls shall be laid in continuous running bond except where otherwise indicated on the drawings. Face brick shall be tied as herein specified.

2. Concrete Block. Masonry units shall be laid in running bond, with vertical joints centered over units in course below.

G. PROTECTION OF MASONRY WALLS

1. The tops of exterior walls shall be adequately protected at night and during inclement weather or during delays in the work.

2. All work likely to be damaged shall be covered at the end of the day's work.

H. CLEANING

1. Upon completion of work, including the pointing of mortar joints as necessary, clean all exposed masonry with Sure Klean® 600 as manufactured by Prosoco or approved equal detergent type cleaning agent. Care shall be exercised at all times to prevent damage to aluminum and other such materials.

2. Inspect walls and partitions and remove all excess mortar in such a manner as to prevent any damage to the faces of units in the walls.

3. Mix the cleaning solution in strict accordance with the manufacturer's instructions for the particular type of masonry. Soak all masonry surfaces with clean water immediately before cleaning. Start at the top of the wall to be cleaned and keep the uncleaned portion wet and flushed with clean water at all times. Apply cleaner and scrub masonry units, not mortar joints, thoroughly. Flush masonry surfaces with clean water immediately after scrubbing with the cleaning solution. Repeat the process as necessary to thoroughly clean the wall surfaces. Do not use a dirty cleaning solution at any time during the cleaning process.

4. Sand blasting and/or high-pressure jet cleaning will be considered provided the General Contractor submits, in ample time for review, complete information as to the type of equipment and material to be used, the name of the company proposed to do the work and any other information pertinent to this type of operation.

   Provide the locations and names of the architects of at least three (3) nearby jobs on which this method of masonry cleaning was used. The manufacturer of the masonry units must approve this method.

I. MASONRY WATERPROOFING

1. When all exterior masonry has been completed, pointed up, cleaned down and approved by the Architect, the entire exterior masonry, including pre-cast concrete, limestone or other trim, shall be given one drenching spray coat of a product equal to MasterProtect H 107.

2. Exterior masonry shall include all brick, block & tile. All other exterior veneer finishes such as pre-cast, stone or limestone shall be waterproofed per SECTION 07 10 00: DAMPPROOFING AND WATERPROOFING.

J. FIRE/SMOKESTOP WALLS

1. All rated fire walls and smokestop walls shall be permanently identified. Each rated wall shall be identified by a sign or stenciling, no further than 12'-0" o.c. above the finished ceiling. The wording should read: "1 hr. (2 hr., 3 hr., 4 hr.) rated fire/smoke barrier; protect all openings and penetrations".

DIVISION 04

SECTION 04 45 00: MARBLE

04 45 00.01: GENERAL

A. SCOPE

1. The work covered by this section of the specifications consists of furnishing all materials, labor, equipment, appliance, scaffolding, etc., in connection with the complete installation, ready for use, of the items specified herein, in strict accordance with this section of the specifications, the general conditions, the applicable drawings and schedule. Install all marble as specified and shown on drawings, and mentioned in schedule. All items under this section shall be furnished, installed and left in perfect condition.

B. APPLICABLE SPECIFICATIONS

1. The latest issue of the Standard Specifications of The Marble Institute of America shall form a part of this specification.

04 45 00.02: MATERIALS

A. MATERIAL

1. See notes on drawings for trade name, color, etc. of marble.

2. The marble shall be genuine marble, cut in square or rectangular shapes as required. All shall be supplied in one grade only and be sound and free from defects that would affect its appearance, durability or permanence on any wall surface.

3. Mortar: All setting mortar shall be a non-staining cement-lime mortar, mixed one part of non-staining cement to three parts of clean approved masonry sand with the addition of one part hydrated lime equal to the volume of cement.

4. Grout: White Portland Cement mixed with water to the consistency of thick cream.

5. Storage of Material: In all instances, all marble in the packages shall be kept dry and not permitted to lie upon the wet or damp surface, nor deposited in any place where freezing is likely to occur.

6. Hardware and Anchorage: All shall be shown on shop drawings. All exposed parts shall be chrome finish; all unexposed anchors, dowels, fasteners, etc., shall be non-corrosive material.

B. FINISH

1. Interior marble as noted shall have a high gloss surface and cushion edges. All other marble shall have a honed surface.

C. SAMPLES

1. Submit (2) two 12" x 24" samples to the Architect for approval.

04 45 00.03: EXECUTION

A. LAYING OUT OF WORK

1. All work shall be so laid out that full courses are used. Unless the height of the marble is required to exactly fill the space indicated, full courses shall be used to the nearest attainable height above or below but no more than one half of the height of the course.

B. EDGES

1. All intersections and returns shall be accurately formed. All cutting and drilling shall be neatly done without marring or defacing the surface in anyway. The cut edge against any trim, finish, built-in-fixtures, etc., shall be carefully done. Around electric outlets, plumbing pipes, or fixtures and fittings, marble shall fit so that the regular plates, collars or coverings will overlap the marble.

C. CLEANING

1. After all work is completed, all marble shall be properly cleaned and left in acceptable condition.

04 45 00.04: GUARANTEE

A. Provide a one-year (12 month) guarantee on the materials and workmanship. Any defects which occur during the guarantee period will be repaired at no cost to the Owner. The guarantee period will start on the date of acceptance of the building.

DIVISION 05

SECTION 05 10 00: STRUCTURAL STEEL

05 10 00.01: GENERAL

A. SCOPE

1. Furnish all labor, materials and equipment necessary to fabricate and install all items of structural steel as indicated on the drawings and specified herein.

B. INDUSTRY STANDARDS

1. Some products and execution are specified in this Section by reference to published specifications or standards of the following (with respective abbreviations used):

   a. American Institute of Steel Construction (AISC).
   b. American National Standards Institute, Inc. (ANSI).
   c. The American Society for Testing and Materials (ASTM).
   d. American Welding Society (AWS).
   e. Steel Structures Painting Council (SSPC).

2. The following specifications and codes form a part of this Specification:

   a. American Institute of Steel Construction Publications, 1989 Edition, with commentary and all supplements. Code of Standard Practice for Steel Buildings and Bridges. Specification for the Design, Fabrication and Erection of Structural Steel for Building.
   b. American Welding Society Publications.
      Standard Qualification Procedure, B3.0-41T
      Code for Welding in Building Construction, AWS D1.1-80
   c. Specifications for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts. Approved November 13, 1985, by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.
   d. Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings of the American Institute of Steel Construction, hereafter designated AISC, shall govern structural steel work.

C. QUALIFICATIONS

1. Steel sections shall be of American manufacture in accordance with the Specification requirements hereinafter outlined.

2. Before assigning any welders to work covered by this Section of the Specifications, the Contractor shall provide the Architect with the names of the welders to be employed on the work, together with certification that each of these welders has passed qualification tests using procedures covered in the American Welding Society Standard B3.0, Part II.

   a. The Contractor shall require any welder to retake the test, when, in the opinion of the Architect, the work of the welder creates a reasonable doubt

as to the proficiency of the welder. Tests, when required, shall be conducted at no additional expense to the Owner.

b. Recertification of the welder shall be made to the Owner's representative only after the welder has taken and passed the required re-test.

c. Welders shall have passed the qualification tests within the preceding 12 month period.

d. The Owner's representative may require coupons to be cut from any location in any joint for testing.

e. All sections of welds found defective shall be chipped or cut out to base metal and properly re-welded before proceeding with the work.

f. Should any two coupons cut from the work of any welder show strengths, under tests, less than that of the base metal, it will be considered evidence of negligence or incompetence and such welder shall be permanently removed from the work.

g. When coupons are removed from any part of a structure, the members cut shall be repaired, at no additional cost to the Owner, in a neat and workmanlike manner, with joints of proper type to develop the full strength of the members and joints cut, with peening, as necessary or directed to relieve residual stress.

D. SUBMITTALS

1. Shop drawings shall be submitted for approval in accordance with the General Conditions. Materials shall not be fabricated or delivered to the site before the approved shop drawings have been returned to the Contractor. Only shop drawings completely checked stamps, signed and dated by the Contractor will be considered. The reviewing of shop drawings by the architect is to be regarded as assisting the contractor. In reviewing same, the architect does not relieve the contractor from responsibility for errors or omissions which may exist between the contract documents and the fabricator's shop drawings even though approved. Should errors or omissions be discovered at a later date, they must be corrected by the contractor at his own expense. The contractor must thoroughly acquaint himself with the contract documents and check the shop drawings for compliance with them. Any variation or substitution found between the contract documents and shop drawings shall be reported the architect in writing.

   By modifying or changing the contract documents in the field or by shop drawing without notification of the architect, the general contractor resumes full responsibility for the performance of items changed or modified.

   a. Drawings shall include all shop and erection details, including, cuts, copes, connections, holes, bolts and welds in structural steel.

   b. All welds, both shop and field, shall be indicated by standard welding symbols in the American Welding Society Standard Code of Arc and Gas Welding in Building Construction.

   c. Drawings shall show the size, length and type of each weld.

2. Substitutions of sections or modifications of details, or both, and the reasons therefore shall be approved by the Architect prior to shop drawing submittal.

3. The Contractor shall be responsible for all errors of detailing, fabrication, and for the correct fitting of the structural members.

4. Approval of shop drawings does not authorize changes to contract requirements unless stated in a separate letter or a change order. Where design details are changed in the preparation of shop drawings in an attempt to improve construction, such changes are to be noted and clearly indicated on the shop drawings.

E. PRODUCT HANDLING

1. The Fabricator shall deliver the fabricated structural steel to the job site in such sequence as requested by the Erector.

2. The Contractor shall provide onsite storage for fabricated steel before erection. Material shall be kept free from dirt, grease and other foreign matter, and shall be protected from corrosion. Material shall be stored elevated from the surface approx. 3-1/2".

05 10 00.02: PRODUCTS

A. MATERIALS

1. Structural steel shall be domestic manufacture and shall conform to ASTM A 36 unless otherwise indicated on the Drawings. Structural tubing shall conform to ASTM A500, Grade B. Steel pipe shall conform to ASTM A501.

2. Bolts shall conform to ASTM A 325 or ASTM A 490 and shall be certified American manufactured bolts. Bolts will have written verification of manufacturer and point of origin.

3. Anchor Bolts shall conform to ASTM A 36 round bar stock intended for use in threaded applications. Threads shall be cut not rolled.

4. Direct Tension Indicators shall be manufactured by Cooper and Turner Ltd., or Bethlehem Steel Corporation.

5. Electrodes and flux used for submerged arc welding shall be of the same manufacture. The flux shall be free of contamination from dirt, mill scale, and other foreign material. Fuse flux used in welding shall not be reused.

6. Electrodes for manual metal arc welding shall conform to Classification E7015, E7016, or E7018 of ASTM A233.

7. The bare electrodes and flux used in combination for submerged arc welding shall conform to the requirements of Paragraph 302 of the AWS Code. Grade SAW-2 shall be used for the welding.

8. Primer shall conform to Steel Structures Painting Council 15- 68T, Type I gray oxide. All structural steel shall receive manufacturer's standard rust-inhibitive primer.

B. FABRICATION

1. The provisions of Part 1 of ASIC "Specification of the Design, Fabrication and Erection of Structural Steel for Buildings" adopted November 1, 1978 with respect to workmanship shall govern the fabrication of structures or portions of structures except as herein after modified.

2. Structural material shall be fabricated and assembled in the shop to the greatest extent possible. Shearing, flame-cutting, and shipping shall be done carefully and accurately. Assembled pieces shall be taken apart, if necessary, for the removal of burrs and shavings produced by the reaming operation. Parts not completely connected in the shop shall be secured by bolts, insofar as is practicable, to prevent damage in shipment and handling.

3. Shop connections shall, in general, be welded. Field connections shall be bolted with A325 bolts except where shown on drawings to be welded. Connections not indicated shall be made to conform to the AISC. One-sided or other types of eccentric connections will not be permitted.

4. ASTM A325 bolts shall be used for all bolted connections except where unfinished bolts are shown on the drawings.

5. Unfinished bolts shall be used where shown on the drawings and where set in concrete.

6. Surfaces of joints for welded and ASTM A325 bolted connections shall comply with the cleanliness requirements of wall joint surfaces and contact surfaces within friction-type joints as specified in Specifications for Structural Joints using ASTM A325.

7. Field welded connections will be permitted only where indicated on the drawings. Welded construction shall conform to the AISC.

8. Bolted connections using ASTM A325 bolts shall conform to the AISC Specifications for Structural Joints using ASTM A325. Bolt threads shall be excluded from the shear planes of the contact surfaces between the connected parts and bolts shall be tightened by the "turn-of-nut" method.

9. Holes shall be cut, drilled or punched at right angles of the surface of the metal and shall not be made or enlarged by burning. Holes in base or bearing plates shall be drilled. Holes shall be provided in members to permit connecting the work of other trades unless otherwise noted. Holes shall be clean-cut without torn or ragged edges. Outside burrs resulting from drilling or reaming operations shall be removed. Holes for bolts shall be 1/16" larger than the diameter of the bolt.

10. Contact surfaces between columns and base plates, abutting ends of columns at column connections, where indicated on the structural drawings, and wherever specified elsewhere herein.

11. Surfaces to receive shop coat of primer shall be prepared in accordance with SSPC-SP 2-63, Hand Tool Cleaning.

12. The material to be furnished shall be subject to inspection and tests in the mill, shop and field.

05 10 00.03: EXECUTION

A. STRUCTURAL STEEL

1. Splices and field connections shall be made as shown and noted on the drawings. Erecting equipment shall be suitable and safe for the workmen. Errors in shop fabrication or deformation resulting from handling and transportation that prevent the proper assembly and fitting of parts shall be reported immediately to the Architect for directions as to method of correction. Suitable corrections shall be made at no additional cost to the Owner.

2. The Contractor shall set the bottom nut or each anchor bolt to grade with instruments. Place the column and adjust the bottom nuts to bring the column cap plate to exact grade and to plumb the column; then, secure the top restraining nuts. The 2" space between the top of the footing and the base plate shall be packed with grout working from one side only and using a board until it is pushed out solidly beyond the three free edges. It shall then be struck off evenly with the base plate on all sides. Grout shall have a compressive strength of not less than 4,500 psi.

3. Wedges and shims shall be cut off flush with edge of column base and bearing plate, and shall be left in place.

4. Bolting shall conform to applicable provisions of AISC Specification. Where high strength bolts are used, the method, tension control, wrenches, and inspection shall conform to the Specifications for "Structural Joints Using ASTM A325 or A490 Bolts" and is hereinafter specified.

5. Execute tightening of nuts with properly calibrated wrenches or by turn-of-nut method. When calibrated wrenches are used, check each wrench for accuracy at least once daily for actual conditions of application.

6. Minimum bolt tension for size of bolt used shall be in accordance with tables listed in reference standards. Mark bolts that have been completely tightened with an identifying symbol.

7. After assembly, the various members forming parts of a completed frame or structure shall be aligned and adjusted accurately before being fastened. Tolerance shall conform to AISC. Fastening of splices of compression members shall be done after the abutting surfaces have been brought completely into contact. Bearing surfaces and surfaces that will be in permanent contact shall be cleaned before the members are assembled. As erection progresses, the work shall be securely fastened to take care of all dead load, wind and erection stresses. Splices will be permitted only where indicated. Unless removal is required, all erection bolts used in welded construction may be tightened securely and left in place. Where erection bolts are removed, the holes shall be filled with plug welds and ground smooth. Welding for re-drilling will not be permitted.

8. Driftpins may be used only to bring together the several parts, and shall not be used in such manner as to distort or damage the metal.

9. Cutting: The use of a gas cutting torch in the field for correcting fabrication error shall not be done on any major member in the structural framing. The use of a gas cutting torch is permissible only on minor members, when the member is not under stress, and then only after the approval of the Architect has been specifically given.

10. The frame of steel skeleton buildings shall be carried up true and plumb, wherever necessary to take care of all loads to which the structure may be subjected, including equipment and the operation of same. Such bracing shall be left in place as long as may be required for safety.

11. In a bolted connection structure there shall be first be enough bolts brought to a "snug tight" condition to insure that the parts of the joint are brought into good contact with each other. Snug tight is defined as the tightness attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench. Following this initial operation, bolts shall be placed in any remaining holes in connection and brought to snug tightness. All bolts in the connection shall then be tightened additionally one half turn of the nut, with tightening progressing systematically from the most rigid part of the joint to its free edges. During this operation there shall be no rotation of the part not turned by the wrench.

    Use of load indicator fasteners may be submitted for approval by the Engineer.

DIVISION 05

SECTION 05 21 19: OPEN WEB JOISTS

05 21 19.01: GENERAL

A. SCOPE

1. Furnish all labor, materials and equipment necessary to fabricate and install all open-web steel joists as indicated on the drawings and specified herein.

B. INDUSTRY STANDARDS

1. Some products and execution are specified in this Section by reference to published specifications or standards of the following (with respective abbreviations used):

   a. The American Society for Testing and Material (ASTM).
   b. Steel Joists Institute (SJI).
   c. Steel Structures Painting Council (SSPC).

2. The following Specifications and Codes form a part of this Specification when reference is made to a specific paragraph of the specific Specification or Code:

   a. "Standard Specifications for Open-Web Steel Joists K- Series", adopted by the Steel Joists Institute and the American Institute of Steel Construction, Inc., November 4, 1985.

C. QUALIFICATIONS

1. For purposes of designating type and quality for the work under this Section, Drawings and Specifications are based on products manufactured or furnished by a member firm of the Steel Joist Institute.

2. Products of other manufacturers similar to those specified will be acceptable for use on the Project when approved (in writing) by the Architect subject to the following requirements:

   a. Company shall have had at least three years' experience in the manufacture of steel joists of this type.
   b. Submit complete fabricating details.
   c. Submit a certificate stating that the joist design, materials and workmanship comply with these Specifications.

D. SUBMITTALS

1. Submit to the Architect shop drawings which shall show all details and dimensions necessary for checking, fabrication and installation of joists. Only shop drawings completely checked stamped, signed and dated by Contractor will be considered.

2. Submit certification from the Steel Joist Institute on membership and class of joist approved for manufacture.

E. PRODUCT HANDLING

1. Care shall be exercised at all times to avoid damage through careless handling during unloading, storing and erecting. Dropping of joists shall not be permitted.

2. Contractor shall provide on-site storage for joists before erection. Joists and accessories shall be kept free from dirt, grease and other foreign matter and shall be protected from corrosion. Joists will be stored elevated approximately 3 1/2" from surface.

05 21 19.02: PRODUCTS

A. STEEL JOISTS

1. Joists shall be open-web K, LH or DLH Series steel joists meeting the requirements of the SJI Specifications for the series indicated on the drawings.

2. Roof joists shall have parallel chord, underslung configuration or double pitched top cords as called for on the drawings. Top and bottom chords of all joists shall be hot rolled steel angles.

3. End(s) of joists shall extend a distance of not less than 6 inches over masonry or structural concrete supports, and not less than 2-1/2 inches over steel supports for K-Series Joists and not less than 8 inches over masonry or structural concrete supports and 4 inches over steel supports for LH-Series Joists.

4. Provide end anchorage will be 2-1/8" fillet welds, 1" long at steel supports or as shown and noted on the drawings. Joists bearing in masonry walls shall have masonry anchors, those resting on concrete bond beams, shall be welded to the cast-in plate anchors.

5. Provide extension of bottom chord for suspension of ceiling system where indicated.

6. Primer shall conform to Steel Structures Painting Council 15- 68T, Type I (gray Oxide). All joists shall receive manufacturer's standard rust-inhibitive primer.

7. Provide standard 'SJI' camber in all of the joists.

B. BRIDGING

1. Bridging shall be type and size as indicated on the drawing(s). However, all joists will be braced whether shown or not.

2. In no case shall the number of rows of bridging be less than shown on the drawings, or as required in Section 5.4 (c) of the SJI Specifications.

C. HEADERS

1. All standard joist headers shown on joist plans shall be furnished by the joist manufacturer.

D. ACCESSORIES

1. All accessories recommended by the joist manufacturer must be furnished and installed.

E. TESTING

1. Testing shall be conducted by an independent laboratory approved by the Owner and shall consist of:

    a. Visual inspection and pinch bar testing of each connection of each joist prior to coating.
    b. Submit certification from the Steel Joist Institute on membership and class of joist approved for manufacture.
    c. Steel fabricator shall supply a certificate of testing from the laboratory.

05 21 19.03: EXECUTION

A. SPACING

1. The maximum spacing of steel joists shall be as indicated on the drawings.

B. ANCHORAGE

1. In case details on the drawings modify the anchorage, bearing or bridging requirements of the Standard Specifications of the Steel Joist Institute, the drawings shall govern.

C. CONNECTIONS

1. Connections of joists shall be as shown on the drawings. Welding shall be in accordance with the Structural Steel Section 5A.

D. FIELD TOUCH UPS

1. All welds, weld scars and abrasions on the shop coat shall be touched-up after erection with primer material used for shop coat.

DIVISION 05

SECTION 05 31 23: METAL ROOF DECKING

05 31 23.01: GENERAL

A. SCOPE

1. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

B. DESCRIPTION OF WORK

1. Work Included in This Section

   a. Provide metal roof deck as detailed on Drawings and specified herein.

2. Related Work Specified Elsewhere

   a. Structural Steel – Section 05 10 00

C. QUALITY ASSURANCE

1. Type and Standard of Quality

   a. All metal roof deck shall meet the standards of the Steel Deck Institute.

D. SUBMITTALS

1. Shop Drawings

   a. Submit in accordance with the General Conditions. Drawings shall indicate location of various sheet lengths and sheet quantities, fastening requirements, openings through deck and deck accessories. Shop drawings shall indicate manufacturer's recommendations for attaching deck to supporting members.

2. Manufacturer's Data

   a. Submit for approval three (3) copies of manufacturer's data on deck system to be furnished for the project.

E. PRODUCT HANDLING

1. Delivery

   a. Contractors shall coordinate delivery of materials. Care shall be exercised at all times to avoid damage through careless handling during unloading, storing and erection.

2. Storage

   a. Provide on-site storage for deck sheets and accessories. Steel decking not promptly erected shall be stored off the ground with one end elevated for drainage and shall be protected from weather by waterproofing covering.

05 31 23.02: PRODUCTS

A. MATERIALS

1. Roof Deck

a. Steel Sheets shall conform to ASTM A 446, Grade A or A 611 Grade C with minimum yield point of 33,000 psi.

B. FABRICATION

1. Design

a. Decking shall be designed in accordance with the "Basic Design Specifications" as adopted by the Steel Deck Institute. Design loads shall be as indicated on the structural drawings.

2. Deck

a. Shall be as specified on contract drawings. Minimum length of deck shall provide a three span condition over supporting members. The gauge of deck shall be as indicated on the drawings.

3. Accessories

a. Provide accessories with deck as required by design or SID.

05 31 23.03: EXECUTION

A. INSTALLATION

1. Layout

a. Decking shall be placed in accordance with manufacturer's recommend-ations, approved shop drawings, and as specified herein.

2. Placement

a. Steel deck units shall be placed on the supports and adjusted to final position before being permanently anchored. Each unit shall be brought to proper bearing on the supporting member. The deck units shall be placed in straight alignment for the entire length of the run of ribs and with close registration of the one unit with those abutting units.

3. Fastening

a. Place deck with edges up, flutes at right angles to supports. End laps shall always occur over supports and shall be a minimum of 2". Lap all sheets one-half flute at side laps. Attach sheets to cord of supports by plug welding through special washers or self-drilling and/or self-tapping screws unless noted otherwise on plans. Attachment of metal roof deck to supporting steel member shall be each side and across each side and across the width of the deck as shown on the drawings.

B. FIELD CUTTING

1. Cutting openings through the deck less than 16 square inches in area, and all skews cutting shall be performed in the field. Cutting of openings for pipe, conduit, vents and stack shall be performed by trade involved. Holes shall be cut without affecting the integrity of the load capacity of deck. Holes and openings greater than 6" and up to and including 2'-0" in diameter shall be cut and framed to maintain the structural integrity of the decking.

DIVISION 05

SECTION 05 41 00: LIGHT GAUGE METAL FRAMING

05 41 00.01: GENERAL

A. SCOPE

1. Furnish all labor, materials and equipment necessary to install all steel stud framing, light gage metal roof trusses and metal furring as detailed on the drawings and specified herein.

B. CO-ORDINATION

1. Verify and supplement dimensions and conditions shown on the drawings with field measurements as required.

2. Coordinate all work with related trades so as to cause no delay to any part of the work on the project.

C. SUBMITTALS

1. Submit shop drawings of all items and framing details to the Architect for approval. Materials shall not be fabricated or delivered to the site before the approved shop drawings have been returned to the Contractor.

2. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

05 41 00.02: PRODUCTS

A. SYSTEM COMPONENTS

1. With each type of steel framing required, provide manufacturer's standard steel runners (tracks), blocking, lintels, clip angles, bracing, reinforcements, fasteners, and accessories as recommended by manufacturer for applications indicated, as needed to provide a complete steel framing system.

B. GAUGE

1. Unless otherwise shown or indicated, non-load bearing studs shall be designed to withstand L/600 wind loading and/or in accordance with all local governing codes (minimum gauge of 20). Load bearing conditions shall be designed to withstand loads and deflection per all governing codes (minimum gauge of 16). Provide sealed shop drawings with all applicable loads indicated.

C. MATERIALS

1. Fabricate metal framing components of structural quality steel with a minimum yield point of 40,000 psi for studs, and 33,000 psi for runners in accordance with ASTM A 446.

2. Screws shall be as recommended by the manufacturer.

3. Provide galvanized finish to metal framing components complying with ASTM A 525 with a G60 coating.

4. Manufacturer's standard structural steel studs of size, shape, and gauge indicated, with a minimum flange of 1-5/8" and a flange return lip of 1/2".

5. Manufacturers: Provide "C" shaped, steel studs as manufactured by United States Gypsum, Milcor, Dale Industries or approved equal.

6. Light gage metal trusses shall be shop fabricated.

D. ACCESSORIES

1. Provide all galvanized tie wire, sheet metal screws, and other accessories and fasteners required for a complete installation.

05 41 00.03: EXECUTION

A. INSTALLATION

1. All steel stud framing shall be adequately secured, braced and tied to provide a firm base for the gypsum board panels as indicated. The installation shall be made by skilled workmen in strict accordance with the approved shop drawings.

DIVISION 05

SECTION 05 50 00: MISCELLANEOUS METALS

05 50 00.01: GENERAL

A. SCOPE

1. The work covered by this section of the specifications consists of furnishing all labor, materials, equipment, appliances, scaffolding, etc., in connection with the complete installation, ready for use, of the items specified herein, in strict accordance with this section of the specifications, the general conditions and the applicable drawings.

B. WORK INCLUDED

1. The General Contractor shall furnish and install the following items of miscellaneous steel and iron, which shall include, but is not limited to, the following:

   a. Framing for roof openings.
   b. Supports for roof drains and drain lines as approved by the Architect.
   c. Proper and adequate supports for pipe and ducts.
   d. Proper and adequate supports for roof supported air handling units.
   e. Steel angle bracing members when shown and/or required.
   f. Angle and anchors for securing wood plates, etc.
   g. Welding plates anchored and cast into concrete for securing joists and other structure.
   h. Ladders and anchors. Note: Provide ladder to serve roof. Ladder will be in storage or mechanical area.
   i. Catch basin, frames and covers.
   j. Trench drains, frames and covers.
   k. Heavy steel grilles and anchors.
   l. Anchors for veneering, when shown and/or required.
   m. Steel pipe handrails for stairs and ramps.
   n. Steel lintels, weld plates, clip angles, etc.
   o. Anchors, etc. required for veneering masonry as noted. All loose angles and anchors required for securing marble, granite, limestone, pre-cast, etc. All anchors, etc. that cast into concrete shall be built into masonry.
   p. Galvanized aluminum and/or stainless steel items.

C. COORDINATION

1. Field measurements must be taken as necessary to verify and supplement dimensions and conditions shown on drawings.

2. Supply built-in items in ample time for incorporation in work. Items, anchors, inserts, etc., for miscellaneous metal items, that are required to be built into other work shall be furnished and placed in ample time for incorporation into work and so as to cause no delay to any part of work on project.

D. SUBMITTALS

1. Submit shop drawings of all items to the Architect for approval. Materials shall not be fabricated or delivered to the site before the approved Shop Drawings have been returned to the Contractor. Only Shop Drawings completely checked by the Fabricator and the Contractor will be considered.

05 50 00.02: PRODUCTS

A. STOCK ITEMS

1. Stock commercial materials, products, pattern and fabrication methods meeting requirements of this specification and conforming to details and designs indicated will be acceptable. See drawings for location, size and details not covered in this specification.

B. MATERIALS

1. Steel for structural members shall conform to ASTM A-36.

2. Aluminum shall be proper alloy for intended use.

3. Galvanized iron and steel shall conform to ASTM A385-62 and ASTM A123-69. Pre-treat galvanized pipe with conversion coating: FT TT-C-490, Type III.

4. Stair rails shall be fabricated of 1-1/4" I.D. and 2" I.D. pipe as detailed on the drawings. Use steel pipe on the interior and galvanized steel on the exterior. Wall brackets are to be the same material as the rail and support the rail with 1-1/2" clear to the wall.

5. Metal door louvers for wood doors shall be Titus Model T-800 or equal. Furnish louvers in baked enamel finish over bonderizing and prime coat. Color of enamel will be selected by the Architect from manufacturer's standard colors. Louvers shall be of sizes indicated on the Door Schedule.

6. Vertical ladder to the roof hatch shall be fabricated as detailed on drawings.

7. Stair nosings shall be Wooster Type 150 curb bar, Aluminum. (Except on Charlotte-Mecklenburg Schools where there will be no metal nosings on exterior concrete steps).

8. Provide loose steel angles and plate lintels for openings in masonry walls as indicated on drawings and required by field conditions. Minimum bearings at each end of lintels shall be 8 inches unless otherwise noted on drawings.

9. Miscellaneous items such as weld plates; clip angles; etc., not specifically mentioned hereinafter, shall be furnished and installed under this section in accordance with details on drawings and general requirements specified herein.

10. The carpet edge strip will be equal to Pemko Number 282A extruded aluminum.

C. FABRICATION

1. Form steel, iron and other materials to shape and size required by drawings, with all angles sharp and true and with surfaces well finished, smooth and with well defined lines and arises. Punching and shearing shall be properly and neatly done. Permanent connections shall be riveted, bolted, or welded as required. All exposed welds shall be ground smooth and flush. Joints shall be milled to produce a neat, close fit. Necessary rebates, lugs, and brackets shall be provided as required for neat and substantial assembly of work.

2. Welding shall be performed by operators who are currently qualified by tests (within the past 12 months) as prescribed in "Standard Qualification Procedure" of the American Welding Society to perform the type welding required for the project using a qualified welding procedure.

3. Fillet, butt, continuous and intermittent welds shall be made in accordance with the best standard practices. Surfaces to be welded shall first be cleaned of loose scale, rusts, oil, paint or other foreign matters. Welds shall show uniform section, reasonable smoothness and weld metal, feather edges without overlaps and with a minimum of craters, porosity, and clinkers. Visual inspection of edges and ends of fillets and butt joint welds shall indicate a good fusion with and penetration of base metals. Precaution shall be taken to minimize stresses and distortions due to heat.

4. Miscellaneous metal items shall be shop fabricated insofar as practical and, except where otherwise required, shall be fabricated, assembled, and installed or erected in accordance with applicable requirements and details of "Architectural Metal Handbook", latest edition, of the National Association of Ornamental Metal Manufacturers.

5. All rivets shall be countersunk or flush type especially produced for prison work. Unless otherwise noted or required, rivets shall be 3/8" in diameter and shall be accurately spaced from 4" to 6" on center, and shall be well driven to completely fill holes. Rivet holes shall be punched and reamed as necessary not to exceed 1/16" more in diameter than the rivet used and to insure proper matching of holes. Rivets shall not be staggered. Loose rivets or rivets with imperfect heads or those not having firm bearings in metal shall be replaced with good rivets.

D. SHOP PAINTING

1. All steel and iron which is to be field painted shall be thoroughly cleaned of all dirt, grease, loose scale, rust, or other foreign material and shall be given one coat of manufacturer's standard primer unless otherwise specified or noted on the drawings.

05 50 00.03: EXECUTION

A. INSTALLATION

1. Miscellaneous metal items shall be installed or erected in a secure, workmanlike manner and where applicable in strict accordance with manufacturer's instructions. All items, upon completion, shall be plumb, true and level or installed at required angles.

2. Aluminum and other finished metals shall be thoroughly protected from damage during construction. Any scratches, dents or other damaged areas in such surfaces shall be rubbed, ground and polished as necessary to completely remove such defects and damaged areas.

3. Aluminum surfaces shall be coated or otherwise isolated as necessary to protect metal from damage by contact with concrete, masonry, steel, plaster or other materials that will corrode or damage aluminum. Such protection shall conform to aluminum manufacturer's instructions.

4. All field welds shall be buffed and brushed to remove all loose material and given a drenching coat of rust inhibiting paint and finished as specified herein.

5. Where anchored plates as shown and noted - lags and expansion shields will not be acceptable. Anchors to plates in concrete walls will be welded to the reinforcing.

6. All work must be executed in a neat, substantial and workmanlike manner and to the entire satisfaction of the Architect. All materials shall be new and of the best quality.

7. Miscellaneous Lintels and Shelf Angles:

   a. Provide miscellaneous lintels and shelf angles as indicated or required.
   b. Verify lintels and shelf angles design and placement with the Architect where not shown on the drawings.
   c. Lintels shall have 8" bearings at each end unless shown otherwise.
   d. In masonry veneer or solid masonry walls, provide lintels over all openings in walls.
   e. Weld, bolt, or rivet members together where so indicated, to form complete assembly.

8. Furnish all bolts, nuts, anchor bolts, plates, anchors, ties, clamps, hanger, nails, spikes, screws, straps, toggle and expansion bolts, and other items of rough hardware of sufficient size and number to tie together the various parts of the building and secure all of its parts in place. Such miscellaneous items typically shall be of same material as they contact.

9. Vertical ladders shall be 24" wide (unless shown and noted otherwise), fabricated with 3/8" x 2-1/2" hot-rolled steel rails and 5/8" round steel rungs extending through the rails with connection welds. Space rungs 12" o.c. Anchor ladders at bottoms and tops and at intermediate points not over 6'0" apart, with brackets. Brackets shall be of same size as side rails and of such length as to hold ladder 7" away from walls.

10. Provide steel pipe handrails as detailed. Unless otherwise shown, provide 1-1/2" O.D., standard weight, carbon steel pipe complying with ASTM A 53.

11. Join posts, rails and corners by welded joints made by fitting post to top rail and intermediate rail to post, with radiused corners, groove welding joints, and grinding smooth. Butt railing splices and reinforce by a tight fitting interior sleeve not less than 6" long.

12. Adjust railings prior to securing in place to insure proper matching at butting joints and correct alignment throughout their length. Space posts not more than 8 feet on centers. Plumb posts in each direction. Secure posts and rail ends to building construction as follows.

13. Anchor posts in concrete by means of pipe sleeves set and anchored into the concrete. Provide sleeves of galvanized, standard weight, steel pipe, not less than 6" long, and having an inside diameter not less than 1/2" greater than the outside diameter of the inserted pipe post. Provide steel plate closure secured to the bottom of the sleeve and of width and length not less than 1" greater than the outside diameter of the sleeve. After the posts have been inserted into the sleeves, fill the annular space between post and sleeve solid with molten lead or sulphur or a quick setting hydraulic cement. Cover anchorage joint with a round steel flange welded to the post.

DIVISION 05

SECTION 05 51 10: METAL STAIRS

05 51 10.01: GENERAL

A. SUMMARY

1. This Section includes the following:

   a. Preassembled steel stairs with concrete-filled treads.
   b. Industrial-type stairs with steel floor plate treads.
   c. Steel tube railings attached to metal stairs and to walls adjacent to metal stairs.

2. See Division 05 Section "Pipe and Tube Railings" for pipe and tube railings.

B. PERFORMANCE REQUIREMENTS

1. Structural Performance of Stairs: Provide metal stairs capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

   a. Uniform Load: 100 lbf/sq. ft.
   b. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
   c. Uniform and concentrated loads need not be assumed to act concurrently.
   d. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
   e. Limit deflection of treads, platforms, and framing members to L/360 or ¼ inch, whichever is less.

2. Structural Performance of Railings: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

   a. Handrails:

      1) Uniform load of 50 lbf/ft. applied in any direction.
      2) Concentrated load of 200 lbf applied in any direction.
      3) Uniform and concentrated loads need not be assumed to act concurrently.

   b. Top Rails of Guards:

      1) Uniform load of 50 lbf/ft. applied in any direction.
      2) Concentrated load of 200 lbf applied in any direction.
      3) Uniform and concentrated loads need not be assumed to act concurrently.

   c. Infill of Guards:

      1) Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
      2) Uniform load of 25 lbf/sq. ft. applied horizontally.
      3) Infill load and other loads need not be assumed to act concurrently.

3. Seismic Performance: Provide metal stairs capable of withstanding the effects of earthquake motions determined according to 2002 North Carolina State Building Code.

C. SUBMITTALS

1. Product Data: For metal stairs.

2. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

   a. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. COORDINATION

1. 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.

2. Coordinate locations of hanger rods and struts with other work so that they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.

05 51 10.02: PRODUCTS

A. MANUFACTURERS

1. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

   a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
   b. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

B. METALS

1. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes.

2. Steel Plates, Shapes and Bars: ASTM A 36/A 36M.

3. Steel Tubing: ASTM A 500 (cold formed) or ASTM A 513, Type 5 (mandrel drawn).
4. 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.

5. Wire Rod for Grating Crossbars: ASTM A 510 (ASTM A 510M).

6. Iron Castings: Either gray iron, ASTM A 48/A 48M, Class 30, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

7. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, either commercial steel, Type B, or structural steel, Grade 25 (Grade 170).

8. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, either commercial steel, Type B, or structural steel, Grade 30 (Grade 205).

9. Expanded Metal, Carbon Steel: ASTM F 1267, Class 1 (uncoated).

10. Woven-Wire Mesh: Intermediate-crimp, 2-inch (50 mm) woven-wire mesh, made from 0.135- inch (3.5 mm) nominal diameter wire complying with ASTM A 510 (ASTM A 510M).

11. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.

C. MISCELLANEOUS MATERIALS

1. Cast-Metal Abrasive Nosings: Cast gray iron, Class 20, with an integral abrasive finish.

   a. Manufacturers:

      1) American Safety Tread Co., Inc.
      2) Balco Inc.
      3) Barry Pattern & Foundry Co., Inc.
      4) Granite State Casting Co.
      5) Safe-T-Metal Co.
      6) Wooster Products Inc.

   b. Apply bituminous paint to concealed bottoms, sides and edges of units set into concrete.

2. Extruded Abrasive Nosings: Extruded-aluminum units with abrasive filler.

   a. Manufacturers:

      1) ACL Industries, Inc.
      2) American Safety Tread Co., Inc.
      3) Amstep Products
      4) Armstrong Products, Inc.
      5) Balco Inc.
      6) Granite State Casting Co.
      7) Wooster Products Inc.

   b. Provide ribbed units, with abrasive filler strips projecting 1/16 inch (1.5 mm) above aluminum extrusion.
   c. Provide solid-abrasive-type units without ribs.
   d. Apply clear lacquer to concealed bottoms, sides, and edges of units set into concrete.

3. Fasteners: Provide zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 25 for exterior use, and Class Fe/Zn 5 where built into exterior walls.

4. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.

5. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa), unless otherwise indicated.

6. Welded Wire Fabric: ASTM A 185, 6 by 6 inches (152 by 152 mm) –W1.4 by W1.4, unless otherwise indicated.

7. Precast Concrete Treads: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight concrete with a minimum 28-day compressive strength of 5000 psi (35 MPa) and a total air content of not less than 4 percent or more than 6 percent. Reinforce with galvanized, welded wire fabric, 2 by 2 inches (50 by 50 mm) by 0.062 – inch (1.6-mm) diameter wire.

D. FABRICATION

1. Manufacturers:

   a. Alfab, Inc.
   b. American Stair, Inc.
   c. Sharon Companies Ltd. (The).

2. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

   a. Join components by welding, unless otherwise indicated. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. Obtain fusion without undercut or overlap. Remove welding flux immediately. At exposed connections, finish exposed welds smooth and blended.
   b. Use connections that maintain structural value of joined pieces.
   c. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
   d. Form bent-metal corners to smallest radius possible without impairing work.
   e. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.

3. Stair Framing: Fabricate stringers of steel channels. Construct platforms of steel plate or channel headers and miscellaneous framing members.

   a. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.

b. Where stairs are enclosed by gypsum-board assemblies, provide hanger rods or struts to support landings from floor construction above or below.
c. Where masonry walls support metal stirs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

4. Metal-Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.0677 inch (1.7 mm).

a. At Contractor's option, provide stair assemblies with metal-pan subtreads filled with reinforced concrete during fabrication.
b. Provide epoxy-resin-filled treads, reinforced with glass fibers, with slip-resistant, abrasive surface.

5. Abrasive-Coating-Finished, Formed-Metal Stairs: Form risers, treads, and platforms from steel sheet of thickness needed to comply with performance requirements but not less than 0.0966 inch (2.5 mm). Finish tread and platform surfaces with manufacturer's standard epoxy-bonded abrasive finish.

6. Metal Floor Plate Stairs: Form treads and platforms from rolled-steel floor plate of thickness needed to comply with performance requirements but not less than 3/16 inch (4.8 mm). Form treads with integral nosing and back edge stiffener. Weld steel supporting brackets to stringers and weld treads to brackets.

7. Steel Tube Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.

a. Configuration: As indicated on drawings.
b. Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose.
c. Form changes in direction of railings by bending or by inserting prefabricated fittings.
d. Form curves by bending members in jigs to produce uniform curvature without buckling.
e. Close exposed ends of railing members with prefabricated end fittings.
f. Provide wall returns at ends of wall-mounted handrails.
g. Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work.
h. Connect posts to stair framing by direct welding.

E. FINISHES

1. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Finish metal stairs after assembly.

2. Hot-dip galvanize items indicated to be galvanized. Comply with ASTM A 123/A 123M or ASTM A 153/A 153M as applicable.

3. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with requirements indicated below for environmental exposure conditions of installed products:

   a. Exterior Stairs (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   b. Interior Stairs (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

4. Apply shop primer to uncoated surfaces of metal stair components. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

05 51 10.03: EXECUTION

A. INSTALLATION

1. Perform cutting, drilling and fitting required for installing metal stairs. Set units accurately in location, alignment and elevation, measured from established lines and levels and free or rack.

2. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete, unless otherwise indicated.

3. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints. 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.

4. Place and finish concrete fill for treads and platforms to comply with Division 03 Section "Cast-in-Place Concrete."

   a. Install abrasive nosings with anchors fully embedded in concrete.

5. Attach handrails to wall with wall brackets.

   a. Use type of bracket with predrilled hole for exposed bolt anchorage.

6. Adjusting and Cleaning:

   a. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting.
   b. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

DIVISION 06

SECTION 06 05 73: WOOD TREATMENT

06 05 73.01: GENERAL

A. SCOPE

1. Furnish all labor, materials and equipment necessary to complete the preservative treatment of wood items specified in other sections of these Specifications.

06 05 73.02: PRODUCTS

A. MATERIALS

1. Preservative for application by immersion, flood coat, spray or brush treatment shall be equal to "Woodlife® is Inside™" as manufactured by KOP-COAT Wood Protection Products. Preservative shall meet or exceed all requirements of the Minimum Standards of the National Woodwork Manufacturer's Association.

2. Preservative for pressure treatment shall be a water-repellent (paintable) solution of not less than 5% pentachlorophenol dissolved in mineral spirits.

3. Chemical for fire-retardant treatment of framing lumber and plywood shall be FirePRO® as manufactured by Koppers Performance Chemicals, Pittsburgh, PA, Dricon® FRT-by Arch Wood Protection, or equal.

06 05 73.03: EXECUTION

A. PRESSURE PRESERVATIVE TREATMENT

1. Framing lumber, nailers, furring, grounds, blocking, etc. in contact with concrete floors or exterior walls shall be pressure preservative treated. Minimum retention of preservative shall be 0.3 pounds per cubic foot of wood.

B. FIRE-RETARDANT TREATMENT

1. Interior wood framing members and plywood panels shall be pressure impregnated with fire-retardant chemicals in accordance with the recommend-ations of the manufacturer to provide a flame spread, fuel contributed and smoke developed U.L. label certifying this classification. Wood supplied shall be suitable for finishing with paint or varnish.

C. CERTIFICATES

1. The General Contractor shall furnish certificates signed by Contractor and treating plants stating that treated lumber and millwork delivered to site comply with specified treatment requirements. Certificate shall contain name and address of Contractor, project location, quantity of lumber and date or dates of shipments, name of chemical used, retention in pounds per cubic foot of lumber treated and drying of lumber after treatment and before shipping.

DIVISION 06

SECTION 06 10 00: ROUGH CARPENTRY

06 10 00.01: GENERAL

A. SCOPE

1. The work covered by this section of the specifications consists of furnishing all labor, equipment, materials, appliances, scaffolding, etc., in connection with the complete installation, ready for use, of the items specified herein in strict accordance with this section of the specifications, the general conditions, and the applicable drawings.

2. Work consists of all temporary enclosures, supports, grounds, all rough carpentry work, door bucks, nailers, plates, blocking, framing for cabinets, framing around all roof openings, furring, etc., as shown or noted on the drawings or as required to complete all finish work in a satisfactory manner. All of this work shall be properly installed and anchored as shown or required in a strong and substantial manner.

3. All nails, screws, bolts, anchors and other rough hardware for proper installation of rough carpentry shall be provided.

4. Items not specifically mentioned herein shall conform to details on the drawings and with specifications for other similar items.

B. COORDINATION

1. Coordinate the location and installation of framing and furring members with the installation of finishes specified to be furnished under other sections of these specifications.

C. ACTION SUBMITTALS

1. Product Data: For each type of process and factory-fabricated product.
    a. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
    b. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

06 10 00.02: PRODUCTS

A. WOOD PRODUCTS, GENERAL

1. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If not grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

a. Factory mark each piece of lumber with grade stamp of grading agency.
b. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
c. Provide dressed lumber, S45, unless otherwise indicated.

2. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

3. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

a. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

B. WOOD PRESERVATIVE-TREATED LUMBER

1. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, use Category UC3b for exterior construction not in contact with the ground, and use Category UC4a for items in contact with the ground. All wood framing members of any type within 4 feet of floor, all wood nailers on concrete floor, all nailers used to apply or hold in place roof insulation, gravel stops and scuppers, or where conditions of moisture or high humidity prevail, shall be pressure preservative treated in accordance with SECTION 06 05 73 - WOOD TREATMENT.

a. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

2. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

3. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

4. Application: Treat items indicated on Drawings, and the following:

a. Wood cants, nailers, curbs equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
b. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.
c. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
d. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
e. Wood floor plates that are installed over concrete slabs-on-grade.

C. DIMENSION LUMBER FRAMING

1. Non-Load-Bearing Interior Partitions: Construction or No. 2

   a. Application: Interior partitions not indicated as load-bearing.
   b. Species:

      1) Mixed southern pine; SPIB.

2. No. 2 grade.

   a. Application: Framing other than interior partitions not indicated as load-bearing.
   b. Species:

      1) Southern pine; SPIB.

3. Framing Other Than Non-Load-Bearing Interior Partitions: Any species and grade with a modulus of elasticity of at least 1,500,000 psi and an extreme fiber stress in bending of at least 1,000 psi for 2-inch nominal thickness and 12-inch nominal width for single-member use.

   a. Application: Framing other than interior partitions not indicated as load-bearing.

4. Exposed Framing: Provide material hand-selected for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain and wane.

   a. Application: exposed
   b. Species and Grade: Indicated above for load-bearing construction of same type.

D. ENGINEERED WOOD PRODUCTS

1. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.

   a. Extreme Fiber Stress in Bending, Edgewise: 2600 psi for 12-inch nominal-depth members.
   b. Modulus of Elasticity, Edgewise: 1,900,000 psi

E. MISCELLANEOUS LUMBER

1. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

   a. Blocking
   b. Nailers.
   c. Rooftop equipment bases and support curbs.
   d. Cants.
   e. Furring
   f. Grounds.

2. For items of dimension lumber size, provide Construction or No. 2 grade lumber of any species.

3. For concealed boards, provide lumber with 19 percent maximum moisture content and of the following species and grades:

   a. Mixed southern pine; No. 2 grade; SPIB

F. FASTENERS

1. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

   a. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

2. Power-Driven Fasteners: NES NER-272.

3. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

G. METAL FRAMING ANCHORS

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

   a. Simpson Strong-Tie Co., Inc.
   b. USP Structural Connectors
   c. Phoenix Metal Products, Inc.

2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer that meet or exceed those products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

3. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.

   a. Use for interior locations unless otherwise indicated.

4. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.

   a. Use for wood-preservative-treated lumber and where indicated.

06 10 00.03: EXECUTION

A. INSTALLATION, GENERAL

1. Set rough carpentry to required levels and lines, with members plumb, true to line,

cut and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking and similar supports to comply with requirements for attaching other construction.

2. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

3. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

4. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

5. Do not splice structural members between supports unless otherwise indicated.

6. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

7. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

   a. NES NER-272 for power-driven fasteners.
   b. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
   c. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential code for One- and Two-Family Dwellings.

B. WORKMANSHIP

1. All framing shall be erected in a careful and workmanlike manner and shall be in accordance with the details. Where there are no specific details for framing, same shall be erected in accordance with the best practice. Framing shall be cut square on bearing, closely fitted, accurately set to required lines and levels, properly braced and rigidly secured in place.

2. All wood grounds, blocking, furring and nailers shall be of size and shape required for securing gypsum wallboard, wood trim or other work or equipment in place.

C. DELIVERY, STORAGE AND HANDLING

1. Immediately upon delivery to job site, place materials in an area protected from the weather. If despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

2. Store materials in a minimum of 6 inches above ground on a framework or blocking and cover with protective waterproof covering providing for adequate air circulation or ventilation.

3. Do not store seasoned materials in wet or damp portions of the building.

4. Protect fire-retardant materials against high humidity and moisture during storage

and erection.

5. Protect sheet materials from broken corners and damaged surfaces, while unloading.

6. Any material rendered unfit for use shall be removed from the site.

DIVISION 06

SECTION 06 20 00: FINISH CARPENTRY

06 20 00.01: GENERAL

A. SCOPE

1. The work covered by this section of the specifications shall consist of furnishing all labor, materials, equipment, scaffolding, appliances, etc., in connection with the complete installation, ready for use, of the items specified herein in strict accordance with this section of the specifications, the general conditions, and the applicable drawings. This Contractor must furnish and properly erect in a true and workmanlike manner, with the necessary and proper nails and screws, all finishing materials as noted on the drawings as being furnished by the Contractor. All shall be left in perfect and acceptable condition.

B. SUBMITTALS

1. Before proceeding with finish carpentry work, submit shop drawings for all items, identified with quality, grade, type of finish and species of wood. Show items in related and dimensional position with sections either full size or 3 inches equal 1 foot scale.

06 20 00.02: PRODUCTS

A. WOOD

1. All lumber shall be Association grade marked; (or in lieu thereof, a certificate from an approved laboratory certifying that lumber meets requirements of applicable lumber associations for the species and grades specified shall be submitted to the Architect.)

2. Framing lumber, blocking, etc., except as otherwise specified, shall be spruce.

3. Chipboard shall not be furnished or installed under any condition.

4. Plywood not otherwise specified shall be A-D INT-APA.

5. Wood shelving shall be solid stock "B" or Better western pine or softwood pine with solid stock "B" or Better pine edges.

6. Woodwork and trim not otherwise specified or indicated on drawings shall be "B" or Better western pine or fir. Trim for aluminum windows shall be treated with wood preservative.

7. Items not specifically referred to herein shall conform to details on drawings and to specifications for other similar items.

8. Wood shall be sound, thoroughly seasoned, well manufactured and free of warp that cannot be corrected in process of bridging or nailing. Woodwork shall be dressed on all sides.

9. Wood stairs shall have 3/4" thick "B" or Better kiln dried pine riser and 1 1/8" thick kiln dried Grade I red oak treads unless otherwise noted/detailed.

06 20 00.03: EXECUTION

A. CONDITION OF SURFACES

1. Examine all grounds, stripping and blocking used to secure finish carpentry. Do not begin installation until all defects are corrected.

B. INSTALLATION

1. All items shall be erected plumb, level and true to line; shall be properly braced; and shall be securely anchored in place. Shim as necessary with concealed shims.

2. Accurately scribe and closely fit all face plates, filler strips and trim strips to irregularities of adjacent surfaces.

3. Wood trim shall be of sizes and designs shown and shall be installed at locations indicated. Joints shall be coped or mitered, as required, and tightly fitted.

DIVISION 06

SECTION 06 41 00: CABINETWORK/MILLWORK

06 41 00.01: GENERAL

A. SCOPE

1. Furnish and install all cabinets and shelf units as indicated, detailed, specified and as listed on the drawings and illustrated in these specifications and/or drawings.

B. SHOP DRAWINGS

1. Shop Drawings shall be submitted for approval before proceeding with fabrication. They shall show all dimensions, thickness, construction and sizes of all members, as well as the manner of assembling the various members which make up the different items. Field measurements shall be taken where necessary to coordinate the work. Plastic laminate joints shall be shown and care shall be used to align the joints and to place the joints in line with the panels.

C. COORDINATION WITH OTHER TRADES

1. This contractor shall coordinate his work with that of all other trades and make all provisions in his work to receive the work of such trades.

D. DEFINITIONS

1. Exposed: shall mean all exterior surfaces including exterior surfaces of portable cabinetwork which might be against a wall, etc., during periods of non-use.

2. Concealed: shall mean any surface subject to view such as inside of drawers, inside of cabinets including backs of doors or sliding panels, dividers, shelves and tops, bottoms and sides of cabinet interiors.

3. Unexposed: shall mean all surfaces and parts permanently kept from view.

06 41 00.02: PRODUCTS

A. SHOP-BUILT CABINETS/MILLWORK

1. Cabinet configurations shall be as shown on the plans. Units shall be furnished complete with all accessories as shown per the illustrations (shelves, trays, etc.). Any additional illustrations may be on the drawings or in the specifications, either in this section or in the SUPPLEMENTAL SHEETS SECTION.

2. Sinks in countertops will be furnished by the Plumbing Contractor and installed as shown.

3. Shop built cabinets, counters, shelving units, etc. as indicated and detailed on the drawings shall be fabricated to comply with Section 400 - Architectural Cabinets of the Architectural Woodwork Institute Quality Standards, Edition 1 2009, and as amplified by the following:

a. All edge grain of exposed and concealed plywood shall be hardwood banded tongue and groove to match face veneers and solid woods.
b. Exposed doors, drawer fronts, and exposed ends shall be select red oak plywood with solid hardwood edges as listed above and face veneers will be center balance match, except as otherwise noted on the drawings.
c. Plastic laminate shall be Formica, Nevamar, or WilsonArt. Color and pattern to be selected by the Architect. It shall be installed with adhesive in strict accordance with the manufacturer's specifications.
d. Bottoms of drawers, concealed sides and backs shall be 1/2" furniture grade plywood.
e. Hardware:

1) Drawer and door pulls - Stanley No. 4484, Chrome finish.
2) Door hinges - Blum Concealed, Self-Closing 170 Degree opening: #91A6530 or Hafele 5 Point, self-closing 270 Degree opening: #343.11.727.
3) Drawer slides - K & V No. 8500 heavy duty full extension with full ball bearing roller guides.
4) Adjustable shelf brackets - K & V No. 255ZC with 256ZC.
5) Coat Hook - Ives No. 405.
6) All others by prior approval only.

B. PREFABRICATED SCIENTIFIC/MILLWORK

1. The numbered and/or illustrated cabinets will be equal to units supplied by CampbellRhea or Kewaunee as scheduled. Finishes shall be Kewaunee's Stock "Golden Oak", or CampbellRhea Heritage Oak with standard stain, sealer, and top coats. Submit samples to the Architect for selection and approval.

2. Countertops on pieces scheduled from Kewaunee/CampbellRhea will be molded epoxy resin, "KEMRESIN" or "TRESPA" resistance to chemical spills. Edges are self-banded in manufacturer's standard finish thickness. Submit color samples to the Architect for selection and approval.

3. See drawings for schedule and/or illustration(s).

4. All others by prior approval only.

06 41 00.03: EXECUTION

A. INSTALLATION

1. Install all casework in accordance with approved shop drawings and the manufacturer's recommendations. All components shall be fully assembled, installed, and securely fastened in place, plumb and level, in complete working order.

2. All field conditions, dimensions, etc. are to be verified by the Contractor for proper installation of the cabinets. Where the plans show "wall to wall" installation, filler panels will be provided as required. The filler panels will match the cabinet finish. The Casework Contractor will coordinate all utility connections with other contractors.

B. CUTTING HOLES

1. No holes shall be cut in any of the cabinetwork for electrical outlets, switches, etc., without the Architect's approval. If any holes are cut without the Architect's approval, the complete item shall be replaced at no additional cost.

2. All cutting of countertops, cabinets, etc. will be by the Casework Contractor. Coordinate with other Contractors. Installation of sinks in countertops will be by the Plumbing Contractor.

C. CLEANING

1. All work shall be left clean and protected until final acceptance.

06 41 00.04: GUARANTEE

A. GUARANTEE

1. All materials and workmanship shall be guaranteed by sub-contractor for a period of 2 years after acceptance of the work.

DIVISION 07

SECTION 07 10 00: DAMPPROOFING AND WATERPROOFING

07 10 00.01: GENERAL

A. SCOPE

1. The work covered by this section of the specifications consists of furnishing all labor, materials, equipment, appliances, scaffolding, etc., in connection with the complete installation, ready for use, of the items specified herein, in strict accordance with this section of the specifications, the general conditions, and applicable drawings.

B. SUBMITTALS

1. Submit written notification of the brand name and manufacturer of each material proposed for use. Obtain approval of materials prior to placing orders.

07 10 00.02: PRODUCTS

A. Slab on ground (Interior): Vapor barrier shall be lapped 15 mil ASTM E 1745 Class A polyolefin equal to Stego® Wrap Vapor Barrier. It shall be uniform thickness throughout. The vapor barrier shall be applied over a subgrade of 4" compacted stone, which has been smoothed by any suitable method which will prevent protrusions which may cause damage or rupture of the vapor barrier. The vapor barrier shall be lapped not less than 6" with top lap placed in the direction of the spreading of the concrete. Laps on adjoining wall surfaces shall be sealed manufacturer's approved tape or mastic. All interior slabs on grade and basement walls shall have product equal to Stego® Wrap Vapor Barrier, and used in strict accordance with the manufacturer's label instructions.

B. Foundation walls: Exterior side of all basement walls, from 8" below finish grade on the exterior and from the underside of concrete slab at interior walls shall be treated with MasterSeal 614 or equal. See drawings. When masonry or concrete surfaces are finished with wallboard, surfaces shall have all holes and defects pointed up and given one brush or roller coat of a product equal to SealMastic Spray-Mastic.

C. Masonry waterproofing (masonry): When all exterior masonry has been completed, pointed up, cleaned down and approved by the Architect, the entire exterior masonry, including pre-cast concrete, limestone or other trim, shall be given one drenching spray coat of a product equal to MasterProtect H 107 in strict accordance with manufacturer's instructions.

D. Applied veneer (Where veneer is Limestone, Granite, Marble or any other approved veneer other than masonry): before any veneer is applied to backing of block, brick, concrete, etc., point up all holes, defects, etc. on surface to which veneer is to be applied and apply one trowel coat of products equal to SealMastic Trowel-Mastic™, or two brush coats of Semi-Mastic™, or one spray coat of Spray-Mastic™.

E. Cavity Dampproofing System (CDS): Apply on exterior side of CMU backup for necessary veneer on all exterior walls which have a cavity. Secure approval of all surfaces and applications before covering. Clean, sound, well pointed, without fins or mortar projections. Wall reinforcement and flashings shall be properly placed. Apply to a slightly damp surface. Apply BASF MasterSeal 610 or 615, WR Meadows Type I SealMastic or approved equal by

brush or spray (rolling not allowed) in strict accordance with printed instructions of manufacturer, using coverage requirements as recommended. Coverage shall be complete, without voids or pinholes, above and below flashings and wall reinforcing, well worked into crevices and around wall reinforcement projections, and over any material that projects into cavity such as structural steel, mechanical vents or pipes or electrical conduit.

F. Pre-cast and porous stone: Exposed pre-cast concrete and/or Limestone shall be cleaned, pointed up and given a drenching coat of a product equal to MasterProtect H 107.

G. Foundation drain: Lay 4" foundation drain tile, corrugated, perforated plastic pipe covered with 12" washed stone and filter fabric to prevent sediment from collecting in drain lines.

H. Fabric flashing: Where fabric flashing is shown, noted or required apply Wasco Multi-Flash 500 copper fabric flashing in strict accordance with the manufacturer's instructions, or Wasco Seal® PVC membrane (flexible sheet membrane) or a similar approved product.

I. Caulking: Refer to SECTION 07 90 00: CAULKING AND SEALANTS.

07 10 00.03: EXECUTION

A. APPLICATION

1. The waterproofing materials shall be applied to the clean exterior unexposed surface of masonry walls below grade in two coats with a brush by a licensed applicator. Waterproofing shall be applied in a continuous coating leaving no pin holes or other surface breaks. Waterproofing shall be carried down to and on top of the wall footing. Provide all protective measures required to prevent injury to the waterproofing until permanent protection has been installed. Beginning of work shall constitute acceptance of surfaces by applicator, and assumption of responsibility for satisfactory job.

2. The slab dampproofing shall be placed in a single layer immediately prior to pouring the slab. All edges shall be lapped a minimum of 6". Care shall be taken to protect the dampproofing from punctures or tears. Any damaged areas shall be repaired with a mopped-on patch 6" larger on all sides than the damaged area.

B. CLEAN-UP

1. Upon completion of the work, remove all debris, surplus materials and incidental equipment from the site.

C. GUARANTEE

1. Contractor shall guarantee all waterproofing for a period of five (5) years against defective materials or workmanship (PA Form 06).

DIVISION 07

SECTION 07 20 00: BUILDING INSULATION

07 20 00.01: GENERAL

A. SCOPE

1. The work covered by this section of the specifications consists of furnishing all labor, equipment, materials, appliances, scaffolding, etc., in connection with the complete installation, ready for use, of the items specified herein, in strict accordance with this section of the specifications, the general conditions, and the applicable drawings.

B. SUBMITTALS

1. Submit manufacturer's information on each material proposed for use. Obtain approval of materials prior to placing orders.

07 20 00.02: PRODUCTS

A. BATT TYPE INSULATION

1. Fiberglass Insulation with reinforced kraft-paper backing. Insulation thickness shall match the thickness of the studs or framing providing a minimum R-value of 13.

B. LOOSE FILL INSULATION

1. Loose fill type insulation shall be vermiculite. The insulation is in loose form and is poured into the concrete block voids and in cavity spaces indicated in the solid brick walls and piers. Equal to Zonolite® Masonry Insulation by Specialty Vermiculite Corp. and will meet or exceed all governing state and local energy code(s).

C. RIGID TYPE INSULATION

1. Rigid insulation shall be extruded polystyrene foam board type with high compressive strength and water resistance as manufactured by Dow, Owens-Corning or equal that will be rated at not less than is required by [either NCSBC or ASHRAE 90.1 (energy conservation code)]. This insulation will be placed in the cavity between the exterior veneer and base wall construction.

D. FOUNDATION INSULATION

1. Perimeter insulation will be rigid board type insulation as manufactured by Dow, Owens-Corning or equal that will be rated at not less than is required by [either NCSBC or ASHRAE 90.1 (energy conservation code)], placed at all perimeter walls from floor level to 18" below finished grade. Where slab on grade is proposed, all such conditions will have in addition to the above mentioned insulation, boards placed horizontally at the entire perimeter (to provide 24" of horizontal coverage).

E. GENERAL NOTE

1. Any condition not noted above or shown on the drawings will be verified with the Architect. All perimeter conditions will be insulated to a minimum R-value of 11 or sufficient to achieve a perimeter envelope R-value of 19 when included in the total R-value of the wall. Refer to the Contract Documents and Drawings for specific specifications. If there is conflicting information, contact the Architect for clarification.

07 20 00.03: EXECUTION

A. INSTALLATION

1. Batt type insulation shall be securely mounted. Work insulation carefully around all obstructions to insure a continuous barrier.

2. Fill insulation will be poured into the masonry cavities as the wall is laid up. Fill all cavities and void spaces. The installation equipment will be approved by the manufacturer. The insulation will extend from the top of the footings to the top of the walls.

3. Rigid insulation at floor slab edges shall extend 24" in from the exterior wall. Insulation shall be placed with joints closely butted and with vertical joints staggered. Installation shall be in strict accordance with manufacturer's installation instructions.

DIVISION 07

SECTION 07 50 00: ROOFING, FLASHING AND SHEET METAL WORK

07 50 00.01: GENERAL

A. SCOPE

1. The work covered by this section of the specifications consists of furnishing all labor, materials, equipment, appliances, scaffolding, etc., in connection with the complete installation, ready for use, of the items specified herein, in strict accordance with this section of the specifications, the general conditions, and the applicable drawings. All sheet metal work includes counter flashings, flashing and roofing of all areas as shown and/or noted on the drawings.

07 50 00.02: MATERIALS

A. ROOFING SHINGLES

1. Shingles shall be thirty (30) year limited warranty Architectural asphalt or fiberglass reinforced asphalt. All shall be installed in strict accordance with the manufacturer's instructions and best practices of the roofing trade. Lay all shingles on layer of fifteen (15) pound asphalt saturated felt properly lapped and nailed. Use double starting row at gutters and at eaves. Use shingle ridge. All roofing nails shall be galvanized, copper or bronze as noted.

2. Shingles shall be warranted from the manufacturer for a period of 30 years minimum.

3. Approved manufacturers are Celotex, CertainTeed and GAF.

4. Roofing underlayment (water and ice shield) by Grace, GAF, CertainTeed or equal shall be installed at valleys, hips, ridges, eaves and rakes.

B. METAL WORK

1. See drawings and notes. All parts, methods, etc., are to be in accordance with "Architectural Sheet Metal Manual published by the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) latest edition and The Application of Copper and Common Sense: Design Principals and Installation Techniques of Sheet Copper Construction" as developed by the Revere Copper Products, Inc. Engineering Staff at its research and development center, Rome, New York. All gutters and conductors will meet or exceed ANSI/SPRI recommendations.

07 50 00.03: EXECUTION

A. REFERENCE STANDARD

1. A brief outline follows relative to the requirements, etc.; however, Copper Development Association (260 Madison Ave. New York, New York 10016, phone 212-251-7200) will govern:

a. Flashing: All flashing shall be as shown and noted on the drawings. All shall be applied by a roofing contractor approved by the manufacturer. Metal flashings as shown and noted shall be noted properly flash all openings in roof.

b. Metal Roofing: Where shown and noted, lay a flat seam metal roof over 15-pound asphalt saturated felt. Lay in strict accordance with the best practices using standard details of SMACNA and the Copper Development Association.

c. Paper: The supporting surfaces under copper gutter linings shall be covered with roofing felt and over this a ply of rosin-sized building paper shall be installed.

d. Gutter Lining: The gutter lining shall be formed of 20 ounce cold rolled copper sheets and conform closely to the profile of the gutter. There shall be no longitudinal seams. The gutter lining may be formed of copper sheets (10') in length. Gutter linings shall have the ends joined together by 3/4" wide cross seams, locked and soldered. Copper will not come into contact with any dissimilar metal unless approved by the Copper Development Association.

e. Connection to Roofing: The back, top edge of the gutter lining shall terminate at the roof edge. The top back edge of the gutter lining shall be folded to form a 3/4" wide loose lock seam and shall be secured with copper cleats spaced 36" on centers. A separate apron strip, not less than 6" wide made from (8 foot) (10 foot) lengths of 16 ounce cold rolled copper lining to form a 3/4" wide loose lock seam bent down at an angle of 45 degrees. This apron flashing shall extend up on the roof boarding under the roofing. The upper edge shall be folded 1/2" and be secured with cleats spaced 24" on centers. The ends of each (10 foot) piece of apron flashing shall be lapped 4 inches. Cant strips, as elsewhere specified, shall be attached to the apron flashing.

f. Outlet Tubes of Built-In Box Gutters: Gutters that connect to interior conductors shall be made of copper or red brass SPS pipe riveted and soldered to the gutter lining. To the upper end of the pipe shall be brazed a 2" wide flange ring or 32-ounce copper that shall be riveted and soldered to the gutter lining. Rivets shall be spaced not more than 3 inches on center and shall be 3/16" in diameter with copper burrs under the peened heads. For connection to the exterior leaders, the lower end of the outlet tube shall be threaded or fitted with a caulking ring.

g. Strainers: Strainers shall be provided at all outlet tubes. They shall be wire basket type formed of No. 14 B & S gauge copper wire, or cast bronze. They shall fit snugly in the outlet tube.

h. Expansion Joints: Expansion joints shall be provided midway between all outlet tubes unless otherwise shown on the drawings. Also, at exterior corners, and where the ends of gutters abut masonry walls, these shall be provided in the same manner. The ends of each gutter section shall be closed with cold rolled copper of the same thickness as the gutter lining copper and shall be flanged, riveted and soldered to the gutter lining. For connection to the expansion joint cover strip, the top edge of the gutter ends shall have a horizontal flange 1- 1/2" wide. The expansion joint shall have an open space one inch wide between adjacent gutter ends of 1/2 inch between gutter end and adjacent wall. A cover strip formed of 16 ounce cold rolled copper shall be provided over the expansion joint and shall be loose locked into the horizontal flanges at the top of the gutter ends. The loose lock joints shall provide for a movement of the ends of the gutter

abutting the masonry wall, there shall be a 1/2-inch open space between the gutter end and masonry wall; the cover strip shall extend under a counter flashing built into the masonry. Ends of cover strips shall terminate in a manner to provide water tight connections and to permit freedom of movement of the gutter lining. An L-type water diversion baffle shall be soldered across the top of the cover strip on line with the centerline of the gutter.

i. Leaders:

1) Leaders or downspouts shall be constructed of 16 ounce cold rolled copper in 10-foot lengths where possible. End joints shall telescope 1-1/2" and longitudinal joints shall be locked. The work shall include all necessary elbows, offsets, etc., as required. Leaders shall be rectangular, round or corrugated and of dimensions shown on the drawings.

2) School projects will have galvanized steel water pipe for first 10 feet on all exposed downspouts (or approved equal).

j. Valleys (Closed): Separate pieces of 16-ounce copper flashing shall be built in with each course of roofing material. The flashing shall be as long as the diagonal of the shingle at the center of the valley, and at least 18" wide where the roof slope is more than 6" to the foot and 24" wide where the slope is less than 6" to the foot. The bottom edge of each piece of flashing shall be 1/2" short of the butt line of the shingle in the succeeding course. Each piece of flashing shall be nailed along the upper edge with copper or bronze nails.

k. Valleys (Open): For Shingle roofs, 16 ounce cold rolled copper in 8 or 10 ft. lengths shall be used. Lap ends 6" in direction of flowside edges folded 1/2" for cleating. Slate or tile roofs - 24 ounce cold rolled copper or 16-ounce lead coated copper.

l. Cleats: 2" wide at 24" on center. Secure to wood decking with two copper or bronze nails.

m. Equal slopes: Width of opening at top shall be not less than 5" and should increase at the eaves at 1/8" per foot.

B. GENERAL NOTES

1. The listed weight of copper for various items shall be used:

a.	Gable Ends	16-ounce, edge flashing strip.
b.	Edge Strips	20 ounce, nailed 4"o.c. w/copper nails
c.	Flashing	16 ounce
d.	Valleys	20 ounce
e.	Roof Covers (hood & eave rtrns)	20 ounce
f.	Gutters	20 ounce
g.	Lock strips	16 ounce
h.	Leaders	16 ounce
i.	Leader Straps (hinged bronze)	6' o.c. maximum

C. BOOTS

1. Standard cast iron boot with cleanout similar to Neenah, R-4929 style. Approved manufacturers: Neenah, Zurn and McKinley.

07 50 00.04: WARRANTY

A. WARRANTY

1. The General Contractor shall furnish a certified warranty (PA Form 05) guaranteeing the roofing, flashing and guttering to be water tight and free from defects for a period of twenty-four (24) months, beginning with the date of acceptance of the building by the Architect. The Contractor must notify the Architect of any design, detail, specification, etc., that will prevent his executing the aforementioned certificate of warranty before placing his bid, his failure to do so voids any later complaint or probable cause for failure.

DIVISION 07

SECTION 07 60 00: WALL FLASHING

07 60 00.01: GENERAL

A. SCOPE

1. Furnish and install all fabric type wall flashing as herein specified.

2. Shop drawings required.

07 60 00.02: PRODUCTS

A. MATERIALS

1. Fabric flashing shall be a full sheet of 3 ounce electrolytic sheet copper, bonded on both sides by asphalt to heavy asphalt saturated creped Kraft paper, or similar fabric reinforced with glass fibers.

07 60 00.03: EXECUTION

A. INSTALLATION

1. Protect flashing from tears or punctures during all operations. Apply flashing only after proper surface preparation. Remove all foreign matter, rubbish, debris, etc. fill all holes, joints and cracks; and dress and point all projections flush. The surface shall be clean and dry during installation. All flashing shall be installed in accordance with the manufacturer's current recommendations concerning materials, application methods, and adhesive techniques. Joints in flashing shall be lapped and sealed in accordance with manufacturer's recommendations.

2. Flash below the level of weep holes and carry to a maximum of 1 inch into mortar joint. Turn flashing up a minimum of 8 inches and into the "backup" wall not more than 1 inch. Where flashing turns up against a vertical surface secure in place with roofers mastic. Lap at least 6".

3. Flash above all exterior openings, i.e. windows, doors, vents, etc. Flashing will cover lintel and turn up "back up" of rough wall a minimum of 8" and into "back up" wall a minimum of 1".

4. Provide end dams where flashings cross expansion joints.

DIVISION 07

SECTION 07 61 13: SHEET METAL ROOFING SYSTEM

07 61 13.01: GENERAL

A. SCOPE

1. Provide all labor, materials, and equipment for the metal roofing, flashing, scuppers, etc. as indicated and detailed on the drawings and herein specified.

2. Submit manufacturer's written statement that the Applicator is acceptable and experienced in the installation of the proposed metal roofing system.

3. Submit shop drawings for approval and color selection(s) prior to ordering materials.

4. All work will be installed in complete accordance with the latest edition of the SMACNA manual.

5. If an existing roof is adjacent and is noted to be matched. Panel's width and color will be similar.

07 61 13.02: PRODUCTS

A. MATERIALS

1. Roof Systems:

   a. The roof panels shall be AEP "SpanSeam" Panels with 24-gauge UL 90 Kynar® 500 finish as manufactured by AEP-Span Division of Dallas Corporation.
   b. Berridge Double Lock "Zee-lock" seamed as manufactured by Berridge Manufacturing Co., Houston, TX.
   c. MRS System 2500 Double-Lock panel system by Metal Roofing Systems, Inc., Stanley, NC.
   d. DMI Double-Lock DL20 panel system by Dimensional Metals, Inc.

2. All above systems and "or equal" systems approved for use on this project will meet or exceed UL 90 and will be 24 gauge.

3. All systems must be acceptable for use over open purlin framing or solid sheathing depending on the detailed application or project situation.

4. Finish will be Kynar® 500. Color(s) will be selected by Architect unless otherwise noted in Section 00 91 14, 00 91 15 and/or 00 91 16.

5. Roof systems will be complete with 24-gauge vent(s), hip covers, trim, flashing, scuppers and guttering with downspouts as recommended by the manufacturer.

6. Manufacturers other than those specified above must be submitted to the Architect for approval prior to bidding.

07 61 13.03: EXECUTION

A. INSTALLATION

1. Roofing system shall be installed in accordance with the manufacturer's instructions. The system shall be flashed and sealed to form a complete, watertight roof. All fasteners shall be concealed. All required accessories (seam covers, ridge covers, etc.) shall be by the same manufacturer. All metal roofing shall be securely attached to and compatible with the lightweight framing system as shown and detailed on the Drawings.

2. All "Pipe" type roof penetration(s) will be centered in roof panels.

3. Any roof penetration larger than one roof panel will have factory made roof curb(s) and will fit symmetrically over ribs. Curbs will have "attached cap" cells at ribs.

07 61 13.04: WARRANTY

A. WARRANTY

1. Twenty (20) year finish and twenty (20) year watertightness Warranties will be required on all roof systems and "or equal" roof systems approved for use on this project.

DIVISION 07

SECTION 07 90 00: CAULKING AND SEALANTS

07 90 00.01: GENERAL

A. SCOPE

1. Furnish all labor, materials and equipment necessary to complete all caulking and pointing shown on the drawings and specified herein.

B. WORK INCLUDED

1. On the exterior, caulk wall control joints, around all frames in walls, all other locations shown on drawings and/or specified, and as required to assure weather-tight construction.

2. On the interior, caulk and point as necessary at locations shown on drawings and/or specified.

3. Where items are specified to be bedded in caulking compound during installation or erection, caulking is specified to be furnished and applied with such items in accordance with the requirements of this section.

C. SUBMITTALS

1. Submit written notification of the brand name and manufacturer of each material proposed for use. Obtain approval of materials prior to placing orders. Provide location for each proposed material and use.

07 90 00.02: PRODUCTS

A. INTERIOR CAULKING COMPOUND

1. All interior caulking shall be done with a gun grade DAP Flexiseal one-part Polysulfide Sealant or equal Thiokol Sealant meeting Federal Specifications TT-S-230.

B. EXTERIOR CAULKING COMPOUND

1. All exterior caulking shall be done with Dow Corning 795 Building Sealant or equal. Compound shall be color to match adjacent work. Material shall be delivered to site in manufacturer's original sealed packages.

C. JOINT BACKING MATERIAL

1. Joint backing material, where required, shall be non-staining resilient polyurethane or polyethylene foam rod type. A bond breaker must be used between the filler and the sealant and will be 25% oversized to the joint to permit the sealant bead to be in compression.

D. MASONRY JOINT SEALS

1. Joint seals shall be specially compounded styrene-butadiene rubber molded into the shape shown on the drawings.

07 90 00.03: EXECUTION

A. APPLICATION

1. Joint and spaces to be caulked shall be clean, dry and free of loose materials. Joints more than 1/2-inch-deep and all joints where suitable backstop has not been provided shall be packed with joint backing material to within ½-inch of surface before applying caulking. In place material will be no thicker than 3/8" and no thinner than 1/8".

2. Apply caulking primer to all surfaces in contact with caulking compound in strict accordance with instructions of manufacturer of caulking compound.

3. Apply caulking compound with gun having proper size and type nozzle; use sufficient pressure to fill all voids and joints solid. Remove excess caulking and leave surfaces neat and clean. Upon completion caulking shall have a smooth even finish. All caulked joints shall be weather-tight and watertight.

DIVISION 08

SECTION 08 11 10: METAL DOORS AND FRAMES

08 11 10.01: GENERAL

A. SCOPE

1. Furnish all labor, material and equipment necessary to complete the fabrication and installation of all Hollow Metal Doors and Frames.

B. SUBMITTALS

2. Shop drawings shall be submitted for approval on all metal doors and frames. A schedule showing location of doors and frames shall be submitted with the shop drawings. Drawings shall indicate elevations of each door and frame type; details of construction; size, shape and thickness of materials; methods, details and thickness of reinforcing; method of assembling sections; provisions for receiving hardware, glazing, finishes; and type and locations of frame anchors.

08 11 10.02: PRODUCTS

A. METAL DOORS

1. Hollow metal doors shall be flush, sized as shown on the drawings, 1-3/4" thick. The face sheets shall be of 16-gage A60 or G60 Galvanized and bonderized steel sheets. There shall be no exposed cracks or visible seams either on the surface faces or the vertical edges of the doors. The top edge of the door shall not be channeled or hold water. Tops shall be flush and closed with no holes. Bottom shall have inverted channel to allow field adjustment if necessary, at a later date. Tops and bottoms of door shall be not less than 16-gage channels. Welds on 2" centers shall occur around the perimeter of the door using the projection welding method. Sound and heat retardation shall be secured by permanently bonding a nominal one-pound density pre-cured rigid polystyrene foam core to the panels. Reinforce doors where closers will attach. Doors shall be painted at factory with one coat baked-on prime paint.

B. HOLLOW METAL FRAMES

1. Frames will be fabricated of cold rolled furniture steel, free of scale, pitting and other surface defects. Frames shall be 14-gage A60 or G60 Galvanized at exterior openings; 16-gage cold rolled at interior openings. Frames will be shaped and sized as shown on the drawings. All frames shall have mitered and welded corners. Frames shall not be drilled to receive silencers. Silencers are adhesive type to be furnished by hardware supplier. Mullions and transom bars shall be tubular construction to match adjoining door frames as shown on the drawings with all joints at heads and jambs mitered and face welded; intersecting mullions and heads and jambs mitered and face welded; intersecting mullions and heads or transom bars and jambs shall be butt welded on face. All welds are to be ground smooth. Provide a removable spreader bar welded to the bottom of all door frames for rigidity during transit and handling only. These shipping bars shall be removed prior to

installation. Provide 16-gage drywall frames where indicated. Provide frames for view windows as indicated and detailed on the drawings. All Hollow Metal Frame anchors to be concealed type anchors -no exposed screw anchors will be permitted. Reinforce frames where closers will attach. Frames shall be painted with one coat baked-on prime paint.

2. Frame anchors at jambs shall be permanently attached to frame and designed to match the wall system they are joining. Yoke and Strap type at masonry walls. Anchors will be of not less than 18-gage steel using not less than 3 anchors per jamb for openings 7 feet or less in height. Provide 16-gage floor anchors at the bottom of all door jambs. All Hollow Metal Frame anchors to be concealed type anchors -no exposed screw anchors will be permitted.

3. Provide labeled frames where scheduled. Frames shall be constructed as necessary to conform to requirements of Underwriters' Laboratories, Inc., for label designation indicated. Door frames shall be Underwriters' label.

4. All frames are to be set with bottom of frames on finish floor level. Anchor to base concrete slab by means of adjustable floor anchors. It is to be noted that the finish above the concrete floor slab will be as follows (unless otherwise shown and/or noted).

Vinyl Composition Tile	1/8"
Carpet	5/8"
Ceramic Tile (mud set)	1-1/2"
Ceramic Tile (thin set)	1/2"
Terrazzo	1-1/2"
Terrazzo Tile	1/8"-3/16"

C. SHOP FINISH

1. Steel surfaces of all doors and frames shall be thoroughly cleaned; exposed surfaces shall be filled and ground smooth. All items not otherwise specified shall be bonderized and shall be given one coat of prime paint.

D. PREPARATION FOR FINISH HARDWARE

1. Finish hardware for all items in this section is specified to be furnished and installed under the FINISH HARDWARE Section. All items specified under this section shall be mortised, reinforced, drilled and tapped at factory to receive finish hardware as scheduled.

2. Doors shall be mortised, reinforced, drilled and tapped to receive specified mortise hardware and reinforced only for specified surface hardware. Drilling and tapping for surface hardware shall be done in the field. Continuous hinge reinforcings shall be continuous full height 12-gage channel welded to the face skin(s). Reinforcings for other surface and mortise hardware shall be 14-gage except closer reinforcings shall be 12-gage.

3. When aluminum doors fit into hollow metal frames or hollow metal entrance construction, all finish hardware to be used in these openings shall be furnished to the proper manufacturer by the hardware supplier under the hardware allowance.

The responsibility for coordination shall rest with the hardware supplier only so far as hardware is concerned. Sizes, clearances, etc., shall be handled between the two manufacturers.

E. DELIVERY AND STORAGE

1. Doors and frames shall arrive at the job site marked to agree with the shop drawings. Store material under cover on wood runners or floors in an upright position and in a manner that will prevent rust and damage.

08 11 10.03: EXECUTION

A. INSTALLATION

1. Frames shall be installed according to S.D.I. recommendations. Frames shall be installed plumb, straight, true, rigidly secured in place and properly braced with temporary spreaders. Frames shall be anchored to concrete floors with expansion bolts or by power-actuated bolts using two bolts per jamb. Temporary spreaders shall not be removed until frames are set and anchored. Contractor shall check all frames for plumbness and correct positioning before anchoring frames to masonry walls and partitions. Frames shall be filled solid at masonry walls with grout as the wall is laid. Provide space for caulking.

2. All doors shall be set true and plumb, with sufficient clearance for free operation not to exceed 1/3 inch at jambs and heads, 1/4 inch at meeting edges of pairs of doors and 3/4 inch at bottom. Strike side of doors shall be so designed to provide proper operating clearance. Finish hardware will be attached prior to any glazing work.

   Manufacturers:

   a. All manufacturers shall be a member of S.D.I. (Steel Door Institute).

   b. The following manufacturers are acceptable, providing they meet the required specifications as indicated in this section:

      1) Ceco
      2) Curries
      3) Pioneer
      4) Steelcraft

DIVISION 08

SECTION 08 14 00: WOOD DOORS

08 14 00.01: GENERAL

A. SCOPE

1. The work covered by this section of the specifications consists of furnishing all labor and materials in connection with the complete installation, ready for use, of the wood doors in strict accordance with this section of the specifications, the general conditions, and the applicable drawings.

08 14 00.02: PRODUCTS

A. MATERIALS

1. All doors are to be manufactured by Algoma Hardwoods, Weyerhaeuser or Eggers Industries. See Door schedule for style, size, finish, etc.

2. Unless otherwise noted, all wood doors are to be solid core and a written certificate so stating shall be signed by a legally qualified representative of the manufacturer and furnished to the Architect.

3. All wood doors shall be guaranteed for the life of installation, against any defects which shall make them unsuitable for use for which they are intended. Any warp in excess of 1/8" in 8' shall be considered a defect under the terms of this guarantee. The guarantee shall provide a replacement as originally furnished. Manufacturer shall inspect the installation of doors prior to issuance of the guarantee, and shall note on the guarantee form that no provisions of the guarantee have been voided or nullified in the installation or manufacture of doors. Guarantee shall be furnished promptly upon completion of the installation of doors.

4. Lights and louvers (where shown and noted): Provide openings where shown and/or scheduled for lights or louvers in accordance with manufacturer's standard details (or as detailed on the drawings), louvers and beads to be of same species and color as face veneer.

    a. Glass - doors shall be job glazed with 1/4" glass as noted. Bed glass in best quality exterior type elastic glazing compound. Nail wood beads tight both sides and with brads, set and fill with matching wood putty.
    b. To avoid weakening the door, at least 5" of solid door must remain between the cutouts, between door edges and cutouts, or between cutouts and hardware mortises.

5. Door manufacturer shall deliver all doors to the job site packed in heavy cardboard cartons, marked to agree with the approved shop drawings.

6. Store under cover on wood runners or floors in a manner that will prevent damage.

B. SUBMITTALS

1. Submit shop drawings for approval on all wood doors. Submit schedule showing locations of doors with the shop drawings. Indicate elevations of doors, details of construction, size, thickness of material, method of assembling, and finishes.

2. Samples of all types of finishes and doors specified shall be submitted for approval at the time of the submission of shop drawings, and shall clearly show all pertinent construction features.

3. Submit three (3) samples of each of lightest and darkest range of color tones proposed for project, for Architect's approval.

4. Door color or quality not matching approved samples will be rejected.

C. DOORS

1. Face veneers shall be Premium "A" grade plain sliced red oak unless otherwise noted in the SUPPLEMENTAL SECTIONS.

2. Face Veneers shall be standard thickness, thoroughly dried, tapeless spliced with Type II adhesive, per CS 35 as revised, laid at right angles to crossbanding. Belt and sand polish. Pairs, side panels and transoms shall be side and/or end matched. Single doors and all multiple panels will be center balance match.

3. Crossbands shall be Birch or Maple, 1/16" thick, tapeless, spliced, no voids.

4. Core shall be one-piece slab, 3 ply particle board, density 25# per cu. ft. or greater, bonded to stiles and rails with Type II adhesive, using high frequency method.

5. Vertical stiles shall be one piece of 3/4" thick hardwood of same species as face veneers, color selected to match faces, and an inner stile of 3/4" hardwood laminated to outer stile to provide minimum thickness (total) after trimming of 1-3/8". Top and bottom rails shall be of same construction, but of any hardwood with a density greater than .350. Where mortise closers or other similar devices occur, blocking shall be provided so that all screws fasten into hardwood for their complete length.

6. All adhesives employed in assembly of door shall be Type II, per CS 35-61.

7. All wood door veneers shall match in grain color, with center balance match.

8. Pairs of doors will be matching veneers (each door will be center balance match, book match flitch.)

D. PRE-FINISH AND MACHINE WORK

1. All interior wood doors shall be completely machined and prefinished by door manufacturer, to accommodate all hardware requiring cutting of door, except hardware applied by surface application. Doors shall be beveled on two vertical edges, mortised for hinges, locks, closers, and trimmed to required sizes, to provide a properly operating door. Transoms and doors shall be rabbeted as required.

2. All plates or other protective devices shall be applied by the door manufacturer, with suitable adhesives, as noted. Bond shall be guaranteed same as doors.

3. Contractor shall provide door manufacturer with all necessary information, including metal buck shop drawings, hardware schedule, floor plans, templates, and samples of hardware required to properly machine doors, same to be in possession of door manufacturer at least 120 days prior to required delivery date of doors. Door manufacturer shall be responsible for properly coordinating information received by him so that doors are properly machined, glazed, and ready to hang.

4. All doors shall be finished by door manufacturer on both faces and four edges using a conversion varnish system, an additional coat of urethane for protection of finish, tone and sheen shall be selected by the Architect from door manufacturer's options. All wood beads shall be finished to match door faces. Finish color: Clear.

E. WOOD FIRE DOORS (Where Specified):

Underwriters Laboratories labeled fire doors, good covered, composite type doors shall be supplied in accordance with the required ratings listed in the Door Schedule. Such doors shall match interior doors in appearance as to face veneers and finish, and be prefit to net sizes. Factory machining shall be limited to only those functions permitted by Underwriters Laboratories.

1. Specify: 1-1/2 Hour Class "B" Fire Door.
Where scheduled Underwriters Laboratories approved factory primed steel vision panels of UL listed sizes shall be installed by door manufacturer. These vision panels will be glazed with 1/4" wire glass bedded in suitable glazing material.

2. Core Construction: Type 1 above.
Mineral composition of calcium silicate with normal density 2 lbs. per cubic foot. Core shall be jointed together with T & G Joints in accordance with Underwriters Laboratories, Inc., Procedures Manual. Core to be smoothly sanded prior to application of crossbands and face veneer. Core shall be glued to edge banding with Type II adhesive.

3. Crossbands: 1-1/2 Hour door --1/16" minimum of non-combustible material extending the full width of the door.

4. Exposed Edge Bands:
Must be Maple lumber treated to refusal with Class "A" fireproofing agent.

08 14 00.03: INSTALLATION

A. Set all doors true and plumb, with sufficient clearance for free operation not to exceed 1/8 inch at jambs and heads, 3/16 inch at meeting edges of pairs of doors and 3/4 inch at bottom. Lock edges of doors shall be so designed to provide proper operating clearance. Attach finish hardware prior to any glazing work.

DIVISION 08

SECTION 08 30 00: SPECIALTY DOORS, ROLLING GRILLE AND SHUTTERS

08 30 00.01: GENERAL

A. SCOPE

1. Furnish all labor, materials and equipment necessary to complete the fabrication and installation of the roll-up doors, overhead doors and ceiling access doors where shown and/or noted on the drawings and specified herein.

B. SUBMITTALS

1. Submit shop drawings and manufacturer's technical data to the Architect for approval. Obtain approvals before placing order.

08 30 00.02: PRODUCTS

A. OVERHEAD DOOR

1. Exterior: The overhead door shall be constructed of flush (both sides) steel insulated panels. Panels shall be 16-gauge zinc coated steel and chemically treated for paint adherence. Stiles shall be 16 gauge or heavier steel. The door shall be the 416 Series or 600 Series as manufactured by the Overhead Door Company or approved equal as shown in the drawings. This door shall be motorized with motor wired to 120v circuit. Atlas and Cookson are approved equal.

2. Interior: The overhead door shall be similar to the Cookson Company type FCM-Motor (belt drive) operated service door w/ aluminum finish. Weather-stripping is not needed. The Overhead Door Company and Atlas Door are approved equal.

3. The overhead door will be for face of wall mount and will be motorized operated.

4. Finish will be paint as per SECTION 09 90 00: PAINTING.

B. ROLLING GRILLE

1. The rolling grille shall be equal to Cookson Visionaire® ESG10 Rolling Grille. The rolling grille curtain shall be constructed of 5/16" solid aluminum rods at 2" on center with vertical chains of eyeletted aluminum spaced at 9" apart. This rolling grille will be motorized. Finish to be selected by Architect.

C. ROLL-UP COUNTER DOOR

1. The roll-up counter door shall be constructed with stainless steel (type F-138) flat crown slats with pitch of 1-3/8". Frame shall be 16-gauge primed steel with 14-gauge stainless steel sill. The door shall be equal to model FCB4 (push up) as manufactured by the Overhead Door Company.

2. Frame finish for frame will be paint as per SECTION 09 90 00: PAINTING.

D. ACCESS DOOR

1. Access door shall be Inryco/Milcor Aluminum Ceiling Access Door Model No. CF-2 or approved equal.

2. Door shall be flush-mounted in ceiling where indicated and shall be 30" x 36" and downward swinging.

3. Finish shall be painted as per SECTION 09 90 00: PAINTING.

E. SECURITY

1. All specialty doors will be lockable, keyed to Owner's requirements.

F. DELIVERY AND STORAGE

1. Deliver special doors and shutters to the job site crated and protected by heavy cardboard, market to agree with the approved shop drawings. Store under cover on wood runners or floors in a manner that will prevent damage.

08 30 00.03: EXECUTION

A. INSTALLATION

1. Hang rolling door, overhead door and shutter true, plumb and in strict accordance with the manufacturer's installation instructions.

2. Install access door in strict accordance with manufacturer's instructions.

B. GUARANTEE

1. Roll-up shutter, rolling door, overhead door and access door shall be warranted against defective workmanship and materials for one year from date of acceptance.

DIVISION 08

SECTION 08 41 13: ALUMINUM WINDOWS AND STOREFRONTS

08 41 13.01: GENERAL

A. SCOPE

1. This Contractor shall furnish all labor and materials to complete fabrication, installation, weatherproofing and other work incidental to or required for completion of all windows, storefront and curtain wall shown on the drawings, scheduled, or herein specified.

    a. Aluminum windows, mullions, door frames, etc. as indicated and detailed on the drawings.
    b. Aluminum sills as indicated.
    c. Glass and glazing is specified in SECTION 08 80 00: GLASS AND GLAZING. Caulking is specified in SECTION 07 90 00: CAULKING AND SEALANTS.
    d. Refer to SECTION 00 21 13, Items 20, 21, and 22 for "or approved equal".

B. SHOP DRAWINGS

1. Submit shop drawings showing complete fabrication and installation details in accordance with requirements of SHOP DRAWINGS SECTION 01 33 00 of Division 01.

08 41 13.02: PRODUCTS

A. ALUMINUM WINDOWS

1. Aluminum Windows shall be Kawneer 8225TL Series thermally-broken fixed, projected and casement out-swing (escape) units and/or Kawneer 5500 Series thermally-broken fixed, projected and casement out-swing (escape) units as scheduled and detailed on the drawing. Horizontal sliding and fixed windows shall be equal to TRACO, TR-6800 and TR-7100, hurricane resistance. EFCO, Winco and YKK are approved equivalent. Refer to SECTION 00 21 13, Items 20, 21 and 22.

2. Aluminum storefront shall be Kawneer Trifab™ VG 601/601T, hurricane resistance Series or equal. Framing as shown on the drawings. Provide door frames as indicated. All must be approved by the Architect.

3. The curtain wall shall be equal to Kawneer 1600 Wall System™2 Curtain Wall for structural silicone glazing, hurricane resistance and 1" Low-e insulated glass as detailed on the drawings.

4. Extrusions shall be 6063-T5 alloy. The finish shall be anodized. Color selected by Architect. The thermal barrier shall consist of a two-part, chemically curing, high density polyurethane. Fasteners, where exposed, shall be aluminum. Perimeter anchors may be aluminum or steel. If steel is used it shall be properly isolated from the aluminum. Glazing gaskets shall be elastomeric extrusions.

5. All hardware shall be compatible with aluminum and shall be in accordance with the manufacturer's recommendations.

6. All windows are to be glazed with 1" Low-e insulating glass as specified in SECTION 08 80 00.

B. ALUMINUM SILLS

1. The aluminum sills as indicated and detailed shall be equal to Style AA, Section #54684 with SA 100 Anchor Clips as manufactured by J. G. Braun a division of The Wagner Companies, Milwaukee, WI. The sills shall be clear anodized to match windows.

08 41 13.03: INSTALLATION

A. INSTALLATION

1. Windows, storefronts and curtain wall shall be installed and adjusted by experienced workmen in accordance with manufacturer's instructions and approved shop drawings and shall be anchored securely.

B. PROTECTION AND CLEANING

1. After installation, both interior and exterior of metal surfaces of windows and sills shall be cleaned of all mortar, paint and other contaminants. After being cleaned, all work shall be protected against damage, until it is accepted by the General Contractor to maintain protection and provide final cleaning.

DIVISION 08

SECTION 08 71 00: FINISH HARDWARE

08 71 00.01: GENERAL

A. RELATED DOCUMENTS

1. Drawings and general provisions of the Contract including General and supplementary Conditions and Division 01 Specifications Sections, apply to this Section.

B. SUMMARY

1. This Section includes the following:
    a. Commercial door hardware for the following:
        1) Swinging doors.
        2) Other doors to the extent indicated.
    b. Cylinders for doors specified in other Sections.
    c. Electrified door hardware.
2. Related Sections include the following:
    a. Division 08 Section 'Metal Doors and Frames'
    b. Division 08 Section 'Wood Doors'
    c. Division 08 Section 'Specialty Doors' for door hardware provided as part of overhead door assemblies.
3. Products furnished, but not installed, under this Section include the following: Coordinating, purchasing, delivering and scheduling remain requirements of this Section.
    a. Permanent cores to be provided by Owner and installed by the Contractor.

C. SUBMITTALS

1. Product Data: Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Samples for Initial Selection (If required by the Architect): For each finish, color and texture required for each type of door hardware indicated.
3. Samples for Verification (If required by the Architect): For exposed door hardware of each type, in specified finish, full size. Tag with full description for coordination with the door hardware sets. Submit Samples before, or concurrent with, submission of the final door hardware sets.
    a. Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.

4. Product Certificates: For electrified door hardware, signed by product manufacturer.

   a. Certify that door hardware approved for use on types and sizes of labeled fire doors complies with listed fire door assemblies.

5. Qualification Data: For Architectural Hardware Consultant (AHC).

6. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency.

7. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.

8. Warranty: Special warranty specified in this Section.

9. Other Action Submittals:

   a. Door Hardware Sets: Prepared by or under the supervision of Architectural Hardware Consultant, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinated the final door hardware sets 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) Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
      3) Content: Include the following information:

         a) Identification number, location, hand, fire rating and material of each door and frame.
         b) Type, style, function, size, quantity and finish of each door hardware item. Include description and function of each lockset and exit device.
         c) Complete designations of every item required for each door or opening including name and manufacturer.
         d) Fastenings and other pertinent information.
         e) Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
         f) Explanation of abbreviations symbols, and codes contained in schedule.
         g) Mounting locations for door hardware.
         h) Door and frame sizes and materials.
         i) Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.

            i. Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.

j) List of related door devices specified in other Sections for each door and frame.

k) Cut Sheets of each product in the Submittal.

l) Submittal Sequence: Submit the final door hardware sets at earliest possible date, particularly where approval of the door hardware sets must precede fabrication of other work that is critical in 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 sets.

b. Keying Schedule: Prepared by or under the supervision of Architectural Hardware Consultant, detailing Owner's final keying instruction for locks. Include schematic keying diagram and index each key set to unique door designations.

D. QUALITY ASSURANCE

1. Installer Qualifications: An employer of workers trained and approved by lock manufacturer.

   a. Supplier's responsibilities may include furnishing and installing door hardware and providing a qualified Architectural Hardware Consultant available during the course of the Work to consult with Contractor, Architect and Owner about door hardware and keying.

   b. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

2. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant (AHC) and who is experienced in providing consulting services for door hardware installations that are comparable in material, design and extent to that indicated for this Project.

3. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

   a. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

4. Fire-Rated Door Assemblies: 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 NFPA 252 & UBC Standard 7-2.

   a. Test Pressure: Test at atmospheric pressure. After 5 minutes into the test, neutral pressure level in furnace shall be established at 40" or less above the sill.

5. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01. In addition to the Architectural Hardware Consultant other decision makers shall be in attendance. Incorporate keying conference decisions into final

keying schedule after reviewing door hardware keying system including, but not limited to, the following:

a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
b. Preliminary key system schematic diagram.
c. Requirements for key control system.
d. Address for delivery of keys.

6. Preinstallation Conference (If required by Architect): Conduct conference at Project site to comply with requirements in Division 01. Review methods and procedures related to electrified door hardware including, but not limited to, the following:

a. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
b. Review sequence of operation for each type of electrified door hardware.
c. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment and facilities needed to make progress and avoid delays.
d. Review required testing, inspecting and certifying procedures.

E. DELIVERY, STORAGE AND HANDLING

1. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

2. Tag each item or package separately with identification related to the final door hardware sets, and include basic installation instructions, templates, and necessary fasteners with each item or package.

3. Deliver keys to manufacturer of key control system for subsequent delivery to Owner as required.

4. Deliver keys to Owner.

5. Templates: Furnish hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware. Upon request, check the shop drawings of such other work to confirm that adequate provisions are made for the proper installation of hardware.

6. The hardware supplier shall visit the project when the hardware is delivered and check it before it is installed. After the hardware is installed, the hardware supplier shall meet with the Owner or his representative and explain the functions, uses, and maintenance of all types of hardware installed. The Contractor shall turn over to the owner, after completion of the work, all tools, wrenches and templates that come packaged with the hardware for the Owner's use in servicing the hardware.

F. COORDINATION

1. Coordinate layout and installation of recessed pivots and floor closers with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement and formwork requirements are specified in Division 03.

2. Templates: Distribute door hardware templates for doors, frames and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

3. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, access control system, security system and building control systems as necessary.

4. Existing Openings: Where new hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide for proper operation.

G. WARRANTY

1. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

   a. Failures include, but are not limited to, the following:

      1) Structural failures including excessive deflection, cracking or breakage.
      2) Faulty operation of operators and door hardware.
      3) Deterioration of metals, metal finishes and other materials beyond normal weathering and use.

   b. Warranty Period: Three years from date of Substantial Completion, except as follows:

      1) Mortise Locksets: 10 years from date of Substantial Completion.
      2) Exit Devices: 5 years from date of Substantial Completion.
      3) Manual Closers: 10 years from date of Substantial Completion.

H. MAINTENANCE SERVICE

1. 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.

2. Maintenance Service: Beginning at Substantial Completion, provide six month's full maintenance by skilled employees of door Hardware Installer.

I. EXTRA MATERIALS (As specified)

1. Furnish full-size units of door hardware described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents as listed in **08 71 00.03: Execution**.

08 71 00.02: PRODUCTS

A. SCHEDULED DOOR HARDWARE

1. General: Provide door hardware for each door to comply with requirements in this Section and door hardware sets indicated in **08 71 00.03: Execution** "Door Hardware Sets" Article:

   a. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.
   b. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

2. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Sets" Article. Products are identified by using door hardware designations, as follows:

   a. Named Manufacturer's Products: Manufacturer and product designation are listed for each door hardware type required for establishing minimum requirements. Manufacturer's names are abbreviated in **08 71 00.03: Execution** "Door Hardware Sets" Article.

3. In other **08 71 00.02: PRODUCTS** articles where titles below introduce lists, the following requirements apply to product selection:

   a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include manufacturers listed as "Approved Manufacturers" in this Section. All other Manufacturers will require prior approval per Section 01 of the Specifications.

B. HINGES, GENERAL

1. Quantity: Provide the following, unless otherwise indicated:

   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.
   e. For doors over 36 inches wide provide 4 ea. 5 x 4.5 HW.

2. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

3. Hinge Weight: Unless otherwise indicated, provide the following:

   a. Exterior Doors: Antifriction-bearing heavy-weight non-ferrous hinges or as specified.
   b. Doors with Closers: Antifriction-bearing hinges.
   c. Interior Doors: As specified.

4. Hinge Base Metal: Unless otherwise indicated, provide the following:

   a. Exterior Hinges: Stainless steel, with stainless-steel pin, Brass, with stainless-steel pin body and brass protruding heads or as specified.
   b. Interior Hinges: Steel, with steel pin or as specified.
   c. Hinges for Fire-Rated Assemblies: Steel, with steel pin, Stainless steel, with stainless-steel pin.

5. Hinge Options: Where indicated in door hardware sets or on Drawings.

6. Electrified Functions for Hinges: Comply with the following:

   a. Power Transfer: Concealed PTFE-jacketed wires, secured at each leaf and continuous through hinge knuckle.
   b. Monitoring: Concealed electrical monitoring switch as specified.
   c. Power Transfer and Monitoring: Concealed PTFE-jacketed wires, secured at each leaf and continuous through hinge knuckle, and with concealed electrical monitoring switch.

7. Fasteners: Comply with the following.

   a. Machine Screws: For metal doors and frames (**drilled and tapped holes**).
   b. Wood Screws: For wood doors and frames (**drilled pilot holes**).
   c. Threaded-to-the-Head Wood Screws: For all wood doors including fire-rated wood doors.
   d. Screws: Phillips flat-head Machine screws (**drilled and tapped holes**) for metal doors. Wood screws for wood doors and frames (**drilled pilot holes**). Finish screw heads to match surface of hinges.

C. HINGES

1. Butts and Hinges: BHMA A156.1 - Listed under Category A in BHMA's "Certified Product Directory".

2. Template Hinge Dimensions: BHMA A156.7.

3. Approved Manufacturers:

   a. Bommer Industries, Inc.
   b. Hager Companies
   c. Stanley Hardware; Div. of dormakaba, USA (STN).

D. CONTINUOUS HINGES

1. Standard: BHMA A156.26.

   a. Listed under Category N in BHMA's "Certified Product Directory."
   b. Fire Pins: Steel pins to hold labeled fire doors in place if required by tested listing.

2. Continuous, Geared Hinges: Extruded-aluminum, geared hinge leaves joined by a continuous extruded-aluminum channel cap with concealed, self-lubricating thrust bearings.

a. Approved Manufacturers:

1) Select Products.
2) Stanley Hardware (STN).
3) Architectural Builders Hardware.

3. Continuous, Pin & Barrel-Type Hinges: Hinge with knuckles formed around a pin that extends entire length of hinge.

a. Base Metal for Exterior Hinges: Stainless-steel.
b. Base Metal for Interior Hinges: As specified.
c. Base Metal for Hinges for Fire-Rated Assemblies: Stainless-steel, Steel.
d. Approved Manufacturers:

1) Architectural Builders Hardware.
2) Stanley hardware; Div. of dormakaba, USA (STN).
3) National Guard Company, Inc. (NGP).

E. LOCKS AND LATCHES, GENERAL

1. Accessibility Requirements: Where indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." And ANSI A117.1.

a. Provide operating devices that do not require tight grasping, pinching or twisting of the wrist and that operate with a force of not more than 5 lbf.

2. Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.

3. Electrified Locking Devices: BHMA A156.25.

4. Lock Trim:

a. Levers: As specified.
b. Escutcheons (Roses): As specified.
c. Dummy Trim: Match lock trim and escutcheons.

5. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:

a. Bored Locks: Minimum 1/2-inch latchbolt throw.
b. Mortise Locks: Minimum 3/4-inch bolt throw.
c. Deadbolts: Minimum 1-inch bolt throw.

6. Backset: 2-3/4 inches, unless otherwise indicated.

7. Strikes: Manufacturer’s standard strike with strike box for each latchbolt or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, and as follows:

a. Strikes for Bored Locks and Latches: BHMA A156.2.
b. Strikes for Mortise Locks and Latches: BHMA A156.13.

c. Strikes for Auxiliary Deadlocks: BHMA A156.5.
d. Extended Lip Strikes: As required for recessed door/frame clearance.

F. MECHANICAL LOCKS AND LATCHES

1. Lock Functions: Function numbers and descriptions indicated in door hardware sets comply with the following:

a. Mortise Locks: BHMA A156.13.

2. Mortise Locks: Stamped steel case with steel or brass parts; BHMA A156.13 - Listed under Category F in BHMA's 'Certified Product Directory'.

a. Approved Manufacturers:

1) Best Access Systems; Div. of dormakaba, USA (BST). 45H Series
2) Sargent Manufacturing Company. 8200 Series.
*3) Schlage Commercial Lock Division. L-9000 Series **(Owner Preferred)***

G. AUXILIARY LOCKS AND LATCHES

1. Auxiliary Locks: BHMA A156.5 - Listed under Category E in BHMA's 'Certified Product Directory'.

a. Approved Manufacturers:

1) Best Access Systems; Div. of dormakaba, USA (BST).
2) Sargent Manufacturing Company.
*3) Schlage Commercial Lock Division. **(Owner Preferred)***

H. ELECTROMECHANICAL LOCKS

1. General: Grade for type of lock indicated; motor or solenoid driven.

2. Approved Manufacturers:

a. Best Access Systems; Div. of dormakaba, USA (BST). 9KW Series.
b. Sargent Manufacturing Company.
*c. Schlage Commercial Lock Division. L-9000 Series Electrified. **(Owner Preferred)***

I. DOOR BOLTS

1. Bolt Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:

a. Mortis Flush Bolts: Minimum ¾-inch throw.

2. Dustproof Strikes: BHMA A156.16.

3. Manual Flush Bolts: BHMA A156.16; designed for mortising into door edge.

a. Approved Manufacturers:

1) Burns Manufacturing Incorporated.

2) Architectural Builders Hardware (ABH).
3) Hager Companies.
4) Trimco (TRM).

4. Automatic and Self-Latching Flush Bolts: BHMA A156.3; designed for mortising into door edge.

1. Approved Manufacturers:

a. Burns Manufacturing Incorporated.
b. Architectural Builders Hardware (ABH).
c. Hager Companies.
d. Trimco (TRM).

J. EXIT DEVICES

1. Exit Devices: BHMA A156.3 - Listed under Category G in BHMA's "Certified Product Directory".

2. Accessibility Requirements: Where handles, pulls, latches, locks and other operating devices are indicated to comply with accessibility requirements, comply with U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." ANSI A117.1.

a. Provide operating devices that do not require tight grasping, pinching or twisting of the wrist and that operate with a force of not more than 5 lbf.

3. Exit Devices for Means of Egress Doors: Comply with NFPA 101. Exit devices shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.

4. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

5. Fire Exit Devices: Devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.

6. Removable Mullions: BHMA A156.3.

7. Fire-Exit Removable Mullions: Provide removable mullions for use with fire exit devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252. Mullions shall be used only with exit devices for which they have been tested.

8. Outside Trim: Material and finish to match locksets, unless otherwise indicated.

9. Through Bolts: For exit devices and trim on fire-rated wood doors.

10. Approved Manufacturers:

a. Precision Hardware; a Div. of dormakaba, USA. (PHI). APEX 2000 Series.
b. Sargent Manufacturing Co. 80 Series.
c. Von Duprin. 98 Series. ***(Owner Preferred)***

K. LOCK CYLINDERS

1. Standard Lock Cylinders: BHMA A156.5.

2. High Security Lock Cylinders: BHMA A156.30.

3. Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:

   a. Number of Pins: As required for this project or specified.
   b. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
   c. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
   d. Bored-Lock Type: Cylinders with tailpieces to suit locks.

      1) High-Security Grade: BHMA A156.5, Grade 1A, listed and labeled as complying with pick- and drill-resistant testing requirements in UL 437 (Suffix A).

4. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:

   a. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturer's cylinders.

5. Construction Keying: Comply with the following:

   a. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

      1) Replace construction cores with permanent cores as indicated in keying schedule or as directed by Owner.
      2) Furnish permanent cores as directed for installation.

6. Manufacturer: Same manufacturer as for locks and latches.

7. Approved Manufacturers:

   a. Schlage Commercial Lock Division. Everest 29 Series. No Substitution.

L. KEYING

1. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.

2. Keys: Nickel silver.

   a. Stamping: Permanently inscribe each key as determined at Keying Conference.

b. Quantity: In addition to one extra key blank for each lock, provide the following:

1) Cylinder Change Keys: Three (3).
2) Master Keys: Five (5).
3) Grand Master Keys: Five (5).
4) Great-Grand Master Keys: Five (5).

M. KEY CONTROL SYSTEM

1. Key Control Cabinet: BHMA A156.5, Grade 1; Metal cabinet with baked-enamel finish; containing key-holding hooks, labels, two (2) sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of 150% of the number of locks.

a. Wall-mounted Cabinet: Cabinet with hinged-panel door equipped with key-holding panels and pin-tumbler cylinder door lock.

2. Cross-Index System: Multiple-index system for recording key information. Include three (3) receipt forms for each key-holding hook.

a. Approved Manufacturers:

1) Key Control Systems, Inc.
2) Lund Equipment Co., Inc.
3) MMF Industries (MMF).

3. Key Lock Boxes:

a. Approved Manufacturers:

1) Knox Company (KNX).

N. MISCELLANEOUS DOOR HARDWARE

1. Standard: BHMA A156.6.

2. Approved Manufacturers:

a. Burns Manufacturing Incorporated.
b. Baldwin Hardware
c. Trimco (TBM).

O. CLOSERS

1. Accessibility Requirements: Where handles, pulls, latches, locks and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." ANSI A117.1.

2. Comply with the following maximum opening-force requirements:

a. Interior, Non-Fire-Rated Doors: 5lbf applied perpendicular to door.
b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

3. Door Closers for Means of Egress Doors: Comply with NGPA 101. Door closers shall not require more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.

4. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

5. Surface Closers: BHMA A156.4 – Listed under Category C in BHMA's "Certified Product Directory." Provide type of arm required for closer to be located on non-public side of door, unless otherwise indicated.

   a. Approved Manufacturers: (Series as specified)

      1) Stanley Door Closer. Div. of dormakaba, USA (SDC).
      2) Norton Door Closers.
      3) LCN Closers. ***(Owner Preferred)***

P. PROTECTIVE TRIM UNITS

1. Size: 2 inches less than door width on push side and 1 inch less than door width on pull side, by height specified in door hardware sets.

2. Fasteners: Manufacturer's standard machine or self-tapping screws, counter-sunk.

3. Metal Protective Trim Units: BHMA A156.6; beveled 4 sides.

   a. Material: 050-inch thick.
   b. Approved Manufacturers:

      1) Burns Manufacturing Incorporated.
      2) Baldwin Hardware
      3) Trimco (TBM).

Q. STOPS AND HOLDERS

1. Stops and Bumpers: BHMA A156.16.

   a. Provide floor stops for doors unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic. Where floor or wall stops are not appropriate, provide overhead holders.

2. Electromagnetic Door Holders: BHMA A156.15. – Listed under Category C in BHMA's "Certified Product Directory."

   a. Coordinate with fire detectors and interface with fire alarm system for labeled fire door assemblies.
   b. Approved Manufacturers:

      1) Architectural Builders Hardware (ABH)
      2) Rixson Door Controls.
      3) DORMA Architectural Hardware; Div. of dormakaba, USA.

3. Silencers for Hollow Metal & Wood Door Frames: BHMA A156.16, Grade 1; neoprene or rubber.

4. Approved Manufacturers:

   a. Burns Manufacturing Incorporated.
   b. Baldwin Hardware
   c. Trimco (TRM).

R. DOOR GASKETING

1. Standard: BHMA A156.22. – Listed under Category J in BHMA's "Certified Product Directory."

2. General: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

   a. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
   b. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
   c. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3. 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.

   a. Provide smoke-labeled gasketing on 20-minute-rated doors and on smoke-labeled doors.

4. 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 NFPA 252 and/or UBC Standard 7-2.

5. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated, based on testing according to ASTM E 1408.

6. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

7. Approved Manufacturers:

   a. National Guard Products (NGP).
   b. Reese Weatherseals.
   c. Zero International.

S. THRESHOLDS

1. Standard: BHMA A156.21. – Listed under Category J in BHMA's "Certified Product Directory".

2. Accessibility Requirements: Where thresholds are indicated to comply with accessibility requirements.

   a. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than ½ inch high.
   b. Thresholds for Means of Egress Doors: Comply with NFPA 101. Maximum ½ inch high.

3. Approved Manufacturers:

   a. National Guard Products (NGP).
   b. Reese Weatherseals.
   c. Zero International.

T. FABRICATION

1. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.

2. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

   a. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.

   b. Steel Machine or Wood Screws: For the following fire-rated applications:

      1) Mortise hinges to doors.
      2) Strike plates to frames.
      3) Closers to doors and frames.

   c. Steel Through Bolts: For the following fire-rated applications unless door blocking is provided:

      1) Surface hinges to doors.
      2) Closers to doors and frames.
      3) Surface-mounted exit devices.

   d. Spacers or Sex Bolts: For through bolting of hollow-metal doors.

e. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."

U. FINISHES

1. Standard: BHMA A156.18, as indicated in door hardware sets.

2. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

3. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

08 71 00.03: EXECUTION

A. EXAMINATION

1. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

2. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

3. Proceed with installation only after unsatisfactory conditions have been corrected.

B. PREPARATION

1. Steel Doors and Frames: Comply with DHI A115 Series.

a. Surface-Applied Door Hardware: **Drill and tap doors and frames** according to ANSI A250.6.

2. Wood Doors: Comply with DHI A115-W Series. **Provide pilot holes for fasteners**.

C. INSTALLATION

1. Mounting Heights: Mount door hardware units at heights indicated on Drawings and as follows unless otherwise indicated or required to comply with governing regulations.

a. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
b. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
c. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

2. Install each door hardware item to comply with manufacturer's 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.

   a. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
   b. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

3. Boxed Power Supplies: Locate power supplies as necessary for non-visible and functional operation.

   a. Configuration: Provide the least number of power supplies required to adequately serve doors with electrified door hardware.

4. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

D. ADJUSTING

1. 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.

   a. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
   b. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
   c. Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

2. Occupancy Adjustment: Approximately Three months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust, including adjusting operating forces, each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.

E. CLEANING AND PROTECTION

1. Clean adjacent surfaces soiled by door hardware installation.

2. Clean operating items as necessary to restore proper function and finish.

3. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

F. DEMONSTRATION

1. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

G. DOOR HARDWARE SETS

HARDWARE SET # 01.0 - CORR ENTRY/EXIT, CLASSROOM EXTERIOR EXIT (3070/HMDXHMF)

DOOR(S): A101B, A107B, D107B, D108B, D109B, D110B, D111B, D112B, D113B, D114B, E102B, E106B, E107B, E108B, E109B, E110B, E111B, E113B, E116B, E121B, G105B, G106B, G107B, G108B, G109B, G110B, G111B, G112B, G118B, G119B, G120B, G121B, G122B, G123B,

EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
1	EA	CONTINUOUS HGE	651HD X LAR	630	STN
1	EA	RIM EXIT DEVICE	3RO 2103 CD SNB X 4903D SNB (STOREROOM, CYLINDER DOGGING)	626W	PHI
1	EA	CYLINDER	RIM TO MATCH EXISTING SYSTEM (ED TRIM)	626	SLG
1	EA	CYLINDER	1-1/4" MORTISE TO MATCH EXISTING SYSTEM (CYLINDER DOGGING)	626	SLG
1	EA	CLOSER	CLD-4550 CS SN (MOUNT PARALLEL ARM - PUSH SIDE)	689	SDC
1	EA	PROTECTION PLT	KO050 10" X 2" LDW B4E/CSK (KICK - PUSH SIDE)	630	TRM
1	EA	HD FLOOR STOP	1209 (MOUNT AT MAX SWING OF CLOSER)	630	TRM
1	EA	SEAL	5050C X LAR (HEAD/JAMBS)	CHAR	NGP
1	EA	SWEEP	601 A X LAR	A	NGP
1	EA	THRESHOLD	513 X LAR X 1/4-20 SS MSEA	A	NGP

HARDWARE SET # 01.1 - CORR ENTRY/EXIT (3070/HMDXHMF/AC)

DOOR(S): A100A,

EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
1	EA	CONTINUOUS HGE	651HD X LAR	630	STN

1	EA	RIM EXIT DEVICE	3RO 2103 CD SNB X 4903D SNB (STOREROOM, CYLINDER DOGGING)	626W	PHI
1	EA	CYLINDER	RIM TO MATCH EXISTING SYSTEM	626	SLG
1	EA	CYLINDER	1-1/4" MORTISE TO MATCH EXISTING SYSTEM (CYLINDER DOGGING)	626	SLG
1	EA	ELECTRIC STRIKE	BES-0563LM (LATCHBOLT MONITOR)	630	BST
1	EA	CLOSER	CLD-4550 CS SN (MOUNT PARALLEL ARM - PUSH SIDE)	689	SDC
1	EA	PROTECTION PLT	KO050 10" X 2" LDW B4E/CSK (KICK - PUSH SIDE)	630	TRM
1	EA	HD FLOOR STOP	1209 (MOUNT AT MAX SWING OF CLOSER)	630	TRM
1	EA	SEAL	5050C X LAR (HEAD/JAMBS)	CHAR	NGP
1	EA	SWEEP	601 A X LAR	A	NGP
1	EA	THRESHOLD	513 X LAR X 1/4-20 SS MSEA	A	NGP
1	EA	AC READER	PROVIDED BY OTHER SECTIONS	N/A	B/O

OPERATIONAL NARRATIVE:

VALID CREDENTIAL AT AC READER RELEASES ELECTRIC STRIKE ALLOWING INGRESS.

FREE EGRESS AT ALL TIMES.

ELECTRIC STRIKE HAS "LM" FOR MONITORING AS REQUEST TO EXIT FOR ACCESS CONTROL SYSTEM ALARM SHUNT.

HARDWARE SET # 02.0 - CROSS CORRIDOR (2-4070/SCWDXHMF)

DOOR(S): A100B, C100C, D100B, E100B, G100B,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
2	EA	CONTINUOUS HGE	651HD X LAR	630	STN
1	EA	K/R MULLION	KR822 X LAR (KEYED/REMOVABLE)	600	PHI
3	EA	CYLINDER	RIM TO MATCH EXISTING SYSTEM (1 EA. MULLION & 2 EA. EXIT DEVICES)	626	SLG
2	EA	RIM EXIT DEVICE	3RO 2108 SNB X 4908D SNB (CLASSROOM)	630	PHI
2	EA	CLOSER	CLD-4550 SN (MOUNT REGULAR ARM - PULL SIDE)	689	SDC
2	EA	PROTECTION PLT	KO050 10" X 1" LDW B4E/CSK (KICK - PUSH SIDE)	630	TRM

2	EA	WALL MAGNETS	2100 X EXTENSIONS AS NECESSARY	630	ABH
1	EA	MULLION SEAL	5100N X LAR	BLK	NGP
2	EA	SILENCER	1229A (HM FRAME)	GREY	TRM

HARDWARE SET # 03.0 - SELF CONTAINED, SPEECH, WORKROOM, LIFE SKILLS, CLASSROOM (3070/SCWDXHMF)

DOOR(S): A101A, A106A, A107A, A108A, A109A, A113A, C108A, C108B, C110A, D107A, D108A, D109A, D110A, D111A, D112A, D113A, D114A, D20A, D121A, D122A, D123A, E101A, E104A, E106A, E107A, E108A, E109A, E110A, E111A, E114A, E116A, E118A, E119A, E121A, E123A,

EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
3	EA	HINGE	CB179 4.5 X 4.5 (NRP AT OUTSWING LOCKED OPNGS)	652	STN
1	EA	LOCKSET	45H0IND14H VIT (INTRUDER W/INDICATOR THUMBTURN)	626	BST
1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG
1	EA	WALL STOP	1270CX (CONVEX)	626	TRM
3	EA	SILENCER	1229A (HM FRAME)	GREY	TRM

HARDWARE SET # 04.0 - UTILITY, CORRIDOR, CLOAK RM (3070/SCWDXHMF)

DOOR(S): A102A, A104A, A104B, B114B, C119.1A,

EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
3	EA	HINGE	CB179 4.5 X 4.5 (NRP AT OUTSWING LOCKED OPNGS)	652	STN
1	EA	LATCHSET	45H0N14H (PASSAGE)	626	BST
1	EA	WALL STOP	1270CX (CONVEX)	626	TRM
3	EA	SILENCER	1229A (HM FRAME)	GREY	TRM

HARDWARE SET # 05.0 - TOILET (3070/SCWDXHMF)

DOOR(S): A103A, A105A, B117A, B118A, B121A, D116.1A, E104.2A, E106.2A, E107.2A, E108.2A, E109.2A, E110.1A, E111.2A, F109A, F110A, G105.2A, G106.2A, G107.2A, G108.2A, G109.2A, G110.2A, G111.2A, G112.2A, G114.1A, G118.2A, G119.2A, G120.2A, G121.2A,

EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
3	EA	HINGE	CB179 4.5 X 4.5 (NRP AT OUTSWING LOCKED OPNGS)	652	STN
1	EA	LATCHSET	45H0L14H VIN (PRIVACY W/INDICATOR)	626	BST
1	EA	CLOSER	CLD3550 SN (MOUNT OUT OF PUBLIC VIEW)	626	SDC
1	EA	PROTECTION PLT	KO050 10" X 2" LDW B4E/CSK (KICK - PUSH SIDE)	630	TRM
1	EA	PROTECTION PLT	KO050 6" X 1" LDW B4E/CSK (MOP - PULL SIDE)	630	TRM
1	EA	WALL STOP	1270CX (CONVEX) (AS NEEDED)	626	TRM
3	EA	SILENCER	1229A (HM FRAME)	GREY	TRM
		NOTE(S):			
			MARBLE THRESHOLD BY OTHERS AS NEEDED.		

HARDWARE SET # 06.0 - STORAGE (3070/SCWDXHMF)

DOOR(S): A110A, B119A, B120A, C109A, C118A, E103.1A,

EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
3	EA	HINGE	CB179 4.5 X 4.5 (NRP AT OUTSWING LOCKED OPNGS)	652	STN
1	EA	LOCKSET	45H0D14H (STOREROOM)	626	BST
1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG
1	EA	WALL STOP	1270CX (CONVEX)	626	TRM
3	EA	SILENCER	1229A (HM FRAME)	GREY	TRM

HARDWARE SET # 07.0 - OFFICE SPACES (3070/SCWDXHMF)

DOOR(S): A111A, A112A, B104A, B105A, B106A, B108A, B112A, B113A, B115A, C104A, C105A, C117A, F106A, F107A, F108A, G103A,

EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
3	EA	HINGE	CB179 4.5 X 4.5 (NRP AT OUTSWING LOCKED OPNGS)	652	STN
1	EA	LOCKSET	45H0A14H (OFFICE/ENTRY)	626	BST
1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG
1	EA	WALL STOP	1270CX (CONVEX)	626	TRM
3	EA	SILENCER	1229A (HM FRAME)	GREY	TRM

HARDWARE SET # 08.0 - MAIN ENTRY (2-3070/ALDXALF/AC/REMOTE RELEASE)

DOOR(S): B100A,

EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
2	EA	CONTINUOUS HGE	661HD EPT X LAR	AL	STN
2	EA	FINGER GUARD	MK1A X LAR	TBD	FGSF
2	EA	PWR TRANSFER	EPT-12C X 10/24GA.	628	PHI
1	EA	K/R MULLION	KR822 X LAR (KEYED/REMOVABLE)	600	PHI
1	EA	CYLINDER	RIM TO MATCH EXISTING SYSTEM (MULLION)	626	SLG
1	EA	RIM EXIT DEVICE	3RO TS MLR 2103 SNB X 4903D (STOREROOM, LATCH RETRACTION, REQUEST TO EXIT)	626W	PHI
1	EA	CYLINDER	RIM TO MATCH EXISTING SYSTEM (DEVICE TRIM)	626	SLG
1	EA	RIM EXIT DEVICE	3RO TS 2102 CD X 4902D (DUMMY TRIM, REQUEST TO EXIT, CYLINDER DOGGING)	626W	PHI
1	EA	CYLINDER	1-1/4" MORTISE TO MATCH EXISTING SYSTEM (CYLINDER DOGGING)	626	SLG
2	EA	CLOSER	CLD-4550 CS SN (MOUNT PARALLEL ARM - PUSH SIDE)	689	SDC
2	EA	HD FLOOR STOP	1209 (MOUNT AT MAX SWING OF CLOSER)	630	TRM
1	EA	SEAL	5050C X LAR (HEAD/JAMBS)	CHAR	NGP
2	EA	SWEEP	601 A X LAR	A	NGP

1	EA	MULLION SEAL	5100N X LAR	BLK	NGP
1	EA	THRESHOLD	513 X LAR X 1/4-20 SS MSEA	A	NGP
1	EA	DESK CONSOLE	CC402DTM (2 SWITCH MOMENTARY) (SHARE WITH HARDWARE SET 12.0)	WHT	DOR
1	EA	AC READER	PROVIDED BY OTHER SECTIONS	N/A	B/O

OPERATIONAL NARRATIVE:

PUSH BUTTON AT DESK CONSOLE WILL RETRACT LATCHBOLT ALLOWING INGRESS. (SEE HARDWARE SET 09.0 - MAIN ENTRY FOR SHARED DESK CONSOLE, BOTH B100A & B101A.)

VALID CREDENTIAL AT AC READER RETRACTS LATCHBOLT ALLOWING INGRESS.

FREE EGRESS AT ALL TIMES.

TS REQUEST TO EXIT FOR ACCESS CONTROL SYSTEM ALARM SHUNT.

HARDWARE SET # 09.0 - VESTIBULE ENTRY/EXIT (2-3070/SCWDXHMF/AC/REMOTE RELEASE)

DOOR(S): B101A,

EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
2	EA	CONTINUOUS HGE	651HD EPT X LAR	630	STN
2	EA	PWR TRANSFER	EPT-12C X 10/24GA.	628	PHI
1	EA	K/R MULLION	KR822 X LAR (KEYED/REMOVABLE)	600	PHI
1	EA	CYLINDER	RIM TO MATCH EXISTING SYSTEM (MULLION)	626	SLG
1	EA	RIM EXIT DEVICE	3RO TS MLR 2103 SNB X 4903D (STOREROOM, LATCH RETRACTION, REQUEST TO EXIT)	626W	PHI
1	EA	CYLINDER	RIM TO MATCH EXISTING SYSTEM (DEVICE TRIM)	626	SLG
1	EA	RIM EXIT DEVICE	3RO TS 2102 CD X 4902D (DUMMY TRIM, REQUEST TO EXIT, CYLINDER DOGGING)	626W	PHI
1	EA	CYLINDER	1-1/4" MORTISE TO MATCH EXISTING SYSTEM (CYLINDER DOGGING)	626	SLG
2	EA	CLOSER	CLD-4550 SN (MOUNT REGULAR ARM - PULL SIDE)	689	SDC

2	EA	FLOOR STOP	1215 CKU	626	TRM
1	EA	SEAL	5050C X LAR (HEAD/JAMBS)	CHAR	NGP
1	EA	MULLION SEAL	5100N X LAR	BLK	NGP
1	EA	DESK CONSOLE	CC402DTM (2 SWITCH MOMENTARY) (SHARE WITH HARDWARE SET 08.0)	WHT	DOR
1	EA	AC READER	PROVIDED BY OTHER SECTIONS	N/A	B/O

OPERATIONAL NARRATIVE:

PUSH BUTTON AT DESK CONSOLE WILL RETRACT LATCHBOLT ALLOWING INGRESS. (SEE HARDWARE SET 08.0 - MAIN ENTRY FOR SHARED DESK CONSOLE, BOTH B100A & B101A.)

VALID CREDENTIAL AT AC READER RETRACTS LATCHBOLT ALLOWING INGRESS.

FREE EGRESS AT ALL TIMES.

TS REQUEST TO EXIT FOR ACCESS CONTROL SYSTEM ALARM SHUNT.

HARDWARE SET # 10.0 - CORRIDOR ENTRY/EXIT (3070/HMDXHMF/UL)

DOOR(S): B101B-2, C100A-2,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
1	EA	CONTINUOUS HGE	651HD X LAR	630	STN
1	EA	RIM EXIT DEVICE	3RO FL2102 X V4902D (VANDAL RESISTANT DUMMY TRIM)	626W	PHI
1	EA	CLOSER	CLD-4550 CS SN (MOUNT PARALLEL ARM - PUSH SIDE)	689	SDC
1	EA	PROTECTION PLT	KO050 10" X 2" LDW B4E/CSK (KICK - PUSH SIDE)	630	TRM
1	EA	HD FLOOR STOP	1209 (MOUNT AT MAX SWING OF CLOSER)	630	TRM
1	EA	SEAL	5050C X LAR (HEAD/JAMBS)	CHAR	NGP
1	EA	SWEEP	601 A X LAR	A	NGP
1	EA	THRESHOLD	513 X LAR X 1/4-20 SS MSEA	A	NGP

HARDWARE SET # 10.1 - CORRIDOR ENTRY/EXIT (3070/HMDXHMF/UL/AC)

DOOR(S): B101B-1, C100A-1,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
1	EA	CONTINUOUS HGE	651HD X LAR	630	STN
1	EA	ELECTRIC STRIKE	BES-0563LM (LATCHBOLT MONITOR)	630	BST
1	EA	RIM EXIT DEVICE	3RO FL2102 X V4902D (VANDAL RESISTANT DUMMY TRIM)	626W	PHI
1	EA	CLOSER	CLD-4550 CS SN (MOUNT PARALLEL ARM - PUSH SIDE)	689	SDC
1	EA	PROTECTION PLT	KO050 10" X 2" LDW B4E/CSK (KICK - PUSH SIDE)	630	TRM
1	EA	HD FLOOR STOP	1209 (MOUNT AT MAX SWING OF CLOSER)	630	TRM
1	EA	SEAL	5050C X LAR (HEAD/JAMBS)	CHAR	NGP
1	EA	SWEEP	601 A X LAR	A	NGP
1	EA	THRESHOLD	513 X LAR X 1/4-20 SS MSEA	A	NGP
1	EA	AC READER	PROVIDED BY OTHER SECTIONS	N/A	B/O

OPERATIONAL NARRATIVE:

VALID CREDENTIAL AT AC READER RELEASES ELECTRIC STRIKE ALLOWING INGRESS.

FREE EGRESS AT ALL TIMES.

ELECTRIC STRIKE HAS "LM" FOR MONITORING AS REQUEST TO EXIT FOR ACCESS CONTROL SYSTEM ALARM SHUNT.

HARDWARE SET # 11.0 - OFFICE CORRIDOR, CONFERENCE, RESOURCE, SM GRP RM, HEALTH RM (3070/SCWDXHMF)

DOOR(S): B103A, B107A, B109A, B110A, B111A, B114A, B122A, B122B, D116A, D118A, E112A, F105A, F105B, G114A,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
3	EA	HINGE	CB179 4.5 X 4.5 (NRP AT OUTSWING LOCKED OPNGS)	652	STN
1	EA	LOCKSET	45H0R14H (CLASSROOM)	626	BST

1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG
1	EA	CLOSER	CLD-4550 SN (MOUNT REGULAR ARM - PULL SIDE)	689	SDC
1	EA	WALL STOP	1270CX (CONVEX)	626	TRM
3	EA	SILENCER	1229A (HM FRAME)	GREY	TRM

HARDWARE SET # 11.1 - RECEPTION (3070/SCWDXHMF/AC)

DOOR(S): B102A,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
3	EA	HINGE	CB179 4.5 X 4.5 (NRP AT OUTSWING LOCKED OPNGS)	652	STN
1	EA	ELECTRIC STRIKE	BES-F2164 X BES-F2LM (LATCHBOLT MONITOR)	630	BST
1	EA	LOCKSET	45H0D14H (STOREROOM) (VESTIBULE SIDE IS SECURE SIDE)	626	BST
1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG
1	EA	CLOSER	CLD-4550 SN (MOUNT REGULAR ARM - PULL SIDE)	689	SDC
1	EA	WALL STOP	1270CX (CONVEX)	626	TRM
3	EA	SILENCER	1229A (HM FRAME)	GREY	TRM
1	EA	AC READER	PROVIDED BY OTHER SECTIONS	N/A	B/O

OPERATIONAL NARRATIVE:

VALID CREDENTIAL AT AC READER RELEASES ELECTRIC STRIKE ALLOWING INGRESS.

FREE EGRESS AT ALL TIMES.

ELECTRIC STRIKE HAS "LM" FOR MONITORING AS REQUEST TO EXIT FOR ACCESS CONTROL SYSTEM ALARM SHUNT.

PUSH BUTTON AT DESK CONSOLE WILL RETRACT LATCHBOLT ALLOWING INGRESS. (SEE HARDWARE SET 12.0-RECEPTION & MAIN ENTRY FOR SHARED DESK CONSOLE, BOTH B102A & B102B.)

HARDWARE SET # 12.0 - MAIN ENTRY LOBBY (3070/SCWDXHMF/AC)

DOOR(S): B102B,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
3	EA	HINGE	CB179 4.5 X 4.5 (NRP AT OUTSWING LOCKED OPNGS)	652	STN
1	EA	ELECTRIC STRIKE	BES-F2164 X BES-F2LM (LATCHBOLT MONITOR)	630	BST
1	EA	LOCKSET	45H0D14H (STOREROOM) (RECEPTION SIDE IS SECURE SIDE)	626	BST
1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG
1	EA	CLOSER	CLD-4550 SN (MOUNT PARALLEL ARM - PUSH SIDE)	689	SDC
1	EA	FLOOR STOP	1215CKU	626	TRM
3	EA	SILENCER	1229A (HM FRAME)	GREY	TRM
1	EA	DESK CONSOLE	CC402DTM (2 SWITCH MOMENTARY)	WHT	DOR
1	EA	AC READER	PROVIDED BY OTHER SECTIONS	N/A	B/O

OPERATIONAL NARRATIVE:

VALID CREDENTIAL AT AC READER RELEASES ELECTRIC STRIKE ALLOWING INGRESS.

FREE EGRESS FROM NON-SECURE SIDE AT ALL TIMES.

ELECTRIC STRIKE HAS "LM" FOR MONITORING AS REQUEST TO EXIT FOR ACCESS CONTROL SYSTEM ALARM SHUNT.

PUSH BUTTON AT DESK CONSOLE WILL RETRACT LATCHBOLT ALLOWING INGRESS. (SEE HARDWARE SET 11.1 - RECEPTION & MAIN ENTRY FOR SHARED DESK CONSOLE, BOTH B102A & B102B.)

HARDWARE SET # 13.0 - TEACHERS' LOUNGE (3070/SCWDXHMF)

DOOR(S): B116A, B116B,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
3	EA	HINGE	CB179 4.5 X 4.5 (NRP AT OUTSWING LOCKED OPNGS)	652	STN
1	EA	LATCHSET	45H0N14H (PASSAGE)	626	BST
1	EA	CLOSER	CLD-4550 SN (MOUNT REGULAR ARM - PULL SIDE)	689	SDC
1	EA	WALL STOP	1270CX (CONVEX)	626	TRM
3	EA	SILENCER	1229A (HM FRAME)	GREY	TRM

HARDWARE SET # 14.0 - CHAIR STORAGE, ACES STORAGE, PE STORAGE, ART STORAGE (2-3070/SCWDXHMF)

DOOR(S): C103A, C106A, C111A, E102.2A,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
6	EA	HINGE	CB179 4.5 X 4.5 (NRP AT OUTSWING LOCKED OPNGS)	652	STN
2	EA	FLUSHBOLT	3917-12	626	TRM
1	EA	DUST PROOF STK	3910	630	TRM
1	EA	LOCKSET	45H0D14H (STOREROOM)	626	BST
1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG
2	EA	OVERHEAD STOP	9030 SERIES (FRICTION HOLD)	S1	ABH
2	EA	SILENCER	1229A (HM FRAME)	GREY	TRM

HARDWARE SET # 15.0 - UTILITY, DATA, AV STORAGE (3070/SCWDXHMF)

DOOR(S): C107A, D104, D117.2A, E105.1A, E115.2A, F104A, F104B, G104A, G115.2A,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
3	EA	HINGE	CB179 4.5 X 4.5 (NRP AT OUTSWING LOCKED OPNGS)	652	STN
1	EA	LOCKSET	45H0D14H (STOREROOM)	626	BST

1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG
1	EA	OVERHEAD STOP	9020 SERIES (STOP ONLY)	S1	ABH
3	EA	SILENCER	1229A (HM FRAME)	GREY	TRM

HARDWARE SET # 16.0 - GYM ENTRY, STUDENT DINING ENTRY (2-4070SCWDXHMF)

DOOR(S): C112A, C113A,

EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
2	EA	CONTINUOUS HGE	651HD X LAR	630	STN
1	EA	K/R MULLION	KR822 X LAR (KEYED/REMOVABLE)	600	PHI
1	EA	CYLINDER	RIM TO MATCH EXISTING SYSTEM (MULLION)	626	SLG
2	EA	RIM EXIT DEVICE	3RO 2114 SNB X 4914D SNB (PASSAGE)	630	PHI
2	EA	CLOSER	CLD-4550 SN (MOUNT REGULAR ARM - PULL SIDE)	689	SDC
2	EA	PROTECTION PLT	KO050 10" X 1" LDW B4E/CSK (KICK - PUSH SIDE)	630	TRM
2	EA	WALL MAGNETS	2100 X EXTENSIONS AS NECESSARY	630	ABH
1	EA	MULLION SEAL	5100N X LAR	BLK	NGP
2	EA	SILENCER	1229A (HM FRAME)	GREY	TRM

HARDWARE SET # 17.0 - EXTERIOR GYM ENTRY/EXIT, STUDENT DINING AREA (2-3070/HMDXHMF)

DOOR(S): C112B-2, C112C-2, C113B,

EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
2	EA	CONTINUOUS HGE	651HD X LAR	630	STN
1	EA	K/R MULLION	KR822 X LAR (KEYED/REMOVABLE)	600	PHI
1	EA	CYLINDER	RIM TO MATCH EXISTING SYSTEM (MULLION)	626	SLG
2	EA	RIM EXIT DEVICE	3RO 2102 SNB X 4902D SNB (DUMMY TRIM)	626W	PHI
2	EA	CLOSER	CLD-4550 CS SN (MOUNT PARALLEL ARM - PUSH SIDE)	689	SDC

2	EA	PROTECTION PLT	KO050 10" X 1" LDW B4E/CSK (KICK - PUSH SIDE)	630	TRM
2	EA	HD FLOOR STOP	1209 (MOUNT AT MAX SWING OF CLOSER)	630	TRM
1	EA	MULLION SEAL	5100N X LAR	BLK	NGP
1	EA	SEAL	5050C X LAR (HEAD/JAMBS)	CHAR	NGP
2	EA	SWEEP	601 A X LAR	A	NGP
1	EA	THRESHOLD	513 X LAR X 1/4-20 SS MSEA	A	NGP

HARDWARE SET # 17.1 - STUDENT DINING AREA (2-3070/HMDXHMF/AC)

DOOR(S): C113C,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
2	EA	CONTINUOUS HGE	651HD EPT X LAR	630	STN
1	EA	K/R MULLION	KR822 X LAR (KEYED/REMOVABLE)	600	PHI
1	EA	CYLINDER	RIM TO MATCH EXISTING SYSTEM (MULLION)	626	SLG
2	EA	PWR TRANSFER	EPT-12C X 10/24GA.	628	PHI
1	EA	RIM EXIT DEVICE	3RO TS MLR 2102 SNB X 4902D SNB (LATCH RETRACTION, STOREROOM)	626W	PHI
1	EA	CYLINDER	RIM TO MATCH EXISTING SYSTEM (DEVICE TRIM)	626	SLG
1	EA	RIM EXIT DEVICE	3RO TS 2102 CD SNB X 4902D SNB (DUMMY TRIM, CYLINDER DOGGING)	626W	PHI
1	EA	CYLINDER	1-1/4" MORTISE TO MATCH EXISTING SYSTEM (CYLINDER DOGGING)	626	SLG
2	EA	CLOSER	CLD-4550 CS SN (MOUNT PARALLEL ARM - PUSH SIDE)	689	SDC
2	EA	PROTECTION PLT	KO050 10" X 1" LDW B4E/CSK (KICK - PUSH SIDE)	630	TRM
2	EA	HD FLOOR STOP	1209 (MOUNT AT MAX SWING OF CLOSER)	630	TRM
1	EA	MULLION SEAL	5100N X LAR	BLK	NGP
1	EA	SEAL	5050C X LAR (HEAD/JAMBS)	CHAR	NGP
2	EA	SWEEP	601 A X LAR	A	NGP
1	EA	THRESHOLD	513 X LAR X 1/4-20 SS MSEA	A	NGP

OPERATIONAL NARRATIVE:

VALID CREDENTIAL AT AC READER RETRACTS LATCHBOLT ALLOWING INGRESS.

FREE EGRESS AT ALL TIMES.

TS REQUEST TO EXIT FOR ACCESS CONTROL SYSTEM ALARM SHUNT.

HARDWARE SET # 18.0 - EXTERIOR GYM ENTRY/EXIT (3070/HMDXHMF)

DOOR(S): C112B-1,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
1	EA	CONTINUOUS HGE	651HD X LAR	630	STN
1	EA	RIM EXIT DEVICE	3RO 2103 CD SNB X 4903D SNB (STOREROOM, CYLINDER DOGGING)	626W	PHI
1	EA	CYLINDER	RIM TO MATCH EXISTING SYSTEM	626	SLG
1	EA	CYLINDER	1-1/4" MORTISE TO MATCH EXISTING SYSTEM (CYLINDER DOGGING)	626	SLG
1	EA	CLOSER	CLD-4550 CS SN (MOUNT PARALLEL ARM - PUSH SIDE)	689	SDC
1	EA	PROTECTION PLT	KO050 10" X 2" LDW B4E/CSK (KICK - PUSH SIDE)	630	TRM
1	EA	HD FLOOR STOP	1209 (MOUNT AT MAX SWING OF CLOSER)	630	TRM
1	EA	SEAL	5050C X LAR (HEAD/JAMBS)	CHAR	NGP
1	EA	SWEEP	601 A X LAR	A	NGP
1	EA	THRESHOLD	513 X LAR X 1/4-20 SS MSEA	A	NGP

HARDWARE SET # 18.1 - EXTERIOR GYM ENTRY/EXIT (3070/HMDXHMF/AC)

DOOR(S): C112C-1,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
1	EA	CONTINUOUS HGE	651HD X LAR	630	STN
1	EA	RIM EXIT DEVICE	3RO 2103 CD SNB X 4903D SNB (STOREROOM)	626W	PHI
1	EA	CYLINDER	RIM TO MATCH EXISTING SYSTEM	626	SLG
1	EA	CYLINDER	1-1/4" MORTISE TO MATCH EXISTING SYSTEM (CYLINDER DOGGING)	626	SLG
1	EA	ELECTRIC STRIKE	BES-0563LM (LATCHBOLT MONITOR)	630	BST

1	EA	PROTECTION PLT	KO050 10" X 2" LDW B4E/CSK (KICK - PUSH SIDE)	630	TRM
1	EA	HD FLOOR STOP	1209 (MOUNT AT MAX SWING OF CLOSER)	630	TRM
1	EA	SEAL	5050C X LAR (HEAD/JAMBS)	CHAR	NGP
1	EA	SWEEP	601 A X LAR	A	NGP
1	EA	THRESHOLD	513 X LAR X 1/4-20 SS MSEA	A	NGP
1	EA	AC READER	PROVIDED BY OTHER SECTIONS	N/A	B/O

OPERATIONAL NARRATIVE:

VALID CREDENTIAL AT AC READER RELEASES ELECTRIC STRIKE ALLOWING INGRESS.

FREE EGRESS AT ALL TIMES.

ELECTRIC STRIKE HAS "LM" FOR MONITORING AS REQUEST TO EXIT FOR ACCESS CONTROL SYSTEM ALARM SHUNT.

HARDWARE SET # 19.0 - OPERATIVE WALL MAN DOOR (3070)

DOOR(S): C113D, C113E,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG

NOTE(S):

ALL HARDWARE PROVIDED BY OPERATIVE WALL MANUFACTURER TO INCLUDE RATED EXIT DEVICE, CLOSER & SEALS PER APPLICABLE CODE.

HARDWARE SET # 20.0 - JANITOR (3070/SCWDXHMF)

DOOR(S): C114A, D117A, D117.1A, E115A, E115.1A, G115A, G115.1A,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
3	EA	HINGE	CB179 4.5 X 4.5 (NRP AT OUTSWING LOCKED OPNGS)	652	STN
1	EA	LOCKSET	45H0R14H (CLASSROOM)	626	BST
1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG
1	EA	WALL STOP	1270CX (CONVEX)	626	TRM

1	EA	PROTECTION PLT	KO050 10" X 2" LDW B4E/CSK (KICK - PUSH SIDE)	630	TRM
1	EA	PROTECTION PLT	KO050 6" X 1" LDW B4E/CSK (MOP - PULL SIDE)	630	TRM
3	EA	SILENCER	1229A (HM FRAME)	GREY	TRM

HARDWARE SET # 21.0 - SERVING LINE ACCESS (4070/SCWDXHMF)

DOOR(S): C115A, C115B,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
1	EA	CONTINUOUS HGE	651HD X LAR	630	STN
1	EA	LOCKSET	45H0R14H (CLASSROOM)	626	BST
1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG
1	EA	CLOSER	CLD-4550 SN (MOUNT REGULAR ARM - PULL SIDE)	689	SDC
1	EA	PLUNGER STOP/HOLD	1255 (MOUNT PULL SIDE)	626	TRM
1	EA	PROTECTION PLT	KO050 10" X 2" LDW B4E/CSK (KICK - PUSH SIDE)	630	TRM
1	EA	PROTECTION PLT	KO050 6" X 6" LDW B4E/CSK (MOP - PULL SIDE) (DO NOT MOUNT PLUNGER STOP/HOLD ON PROTECTION PLATE)	630	TRM
1	EA	WALL STOP	1270CX (CONVEX)	626	TRM
3	EA	SILENCER	1229A (HM FRAME)	GREY	TRM

HARDWARE SET # 22.0 - SERVING LINE ROLLUP GRILL, DISH WASHER ROLLUP (STLXSTL)

DOOR(S): C115C, C116B,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
1	EA	CYLINDER	RIM OR MORTISE TO MATCH EXISTING SYSTEM	626	SLG
		NOTE(S):			
			ALL HARDWARE PROVIDED BY DOOR MANUFACTURER.		

HARDWARE SET # 23.0 - KITCHEN ENTRY/EXIT (4070/HMDXHMF/AC)

DOOR(S): C116A,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
1	EA	CONTINUOUS HGE	651HD X LAR	630	STN
1	EA	RIM EXIT DEVICE	3RO 2103 CD X V4903 D X DR WIDTH (STOREROOM/VANDEL RESISTANT TRIM, CYLINDER DOGGING)	626W	BST
1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG
1	EA	CYLINDER	1-1/4" MORTISE TO MATCH EXISTING SYSTEM (CYLINDER DOGGING)	626	SLG
1	EA	ELECTRIC STRIKE	BES-0563LM (LATCHBOLT MONITOR)	630	BST
1	EA	CLOSER	CLD-4550 CS SN (MOUNT PARALLEL ARM - PUSH SIDE)	689	SDC
1	EA	PROTECTION PLT	KA050 34" X 2" LDW B4E/CSK (ARMOR - PUSH SIDE)	630	TRM
1	EA	PROTECTION PLT	KO050 24" X 1" LDW B4E/CSK (MOP - PULL SIDE)	630	TRM
1	EA	HD FLOOR STOP/HOLD	1209HAHO (HOLD OPEN) (MOUNT AT MAX SWING OF CLOSER)	630	TRM
1	EA	SEAL	5050C X LAR (HEAD/JAMBS)	CHAR	NGP
1	EA	SWEEP	601 A X LAR	A	NGP
1	EA	HD THRESHOLD	626HD X LAR X 1/4-20 SS MSEA	A	NGP
1	EA	VIEWER	976 (180°)	626	TRM
1	EA	AC READER	PROVIDED BY OTHER SECTIONS	N/A	B/O

OPERATIONAL NARRATIVE:

VALID CREDENTIAL AT AC READER RELEASES ELECTRIC STRIKE ALLOWING INGRESS.

FREE EGRESS AT ALL TIMES.

ELECTRIC STRIKE HAS "LM" FOR MONITORING AS REQUEST TO EXIT FOR ACCESS CONTROL SYSTEM ALARM SHUNT.

HARDWARE SET # 24.0 - CAN WASH (3070/HMDXHMF)

DOOR(S): C120A,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
1	EA	CONTINUOUS HGE	651HD X LAR	630	STN
1	EA	LOCKSET	45H0R14H (CLASSROOM)	630	BST
1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG
1	EA	PROTECTION PLT	KA050 34" X 2" LDW B4E/CSK (ARMOR - PUSH SIDE)	630	TRM
1	EA	PROTECTION PLT	KO050 24" X 1" LDW B4E/CSK (MOP - PULL SIDE)	630	TRM
1	EA	PLUNGER STOP/HOLD	1255 (MOUNT PULL SIDE)	626	TRM
1	EA	SEAL	5050C X LAR (HEAD/JAMBS)	CHAR	NGP
1	EA	DOOR SHOE	18V A X LAR	A	NGP
1	EA	THRESHOLD	513 X LAR X 1/4-20 SS MSEA	A	NGP

HARDWARE SET # 25.0 - DRY STORAGE (3070/SCWDXHMF)

DOOR(S): C121A,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
3	EA	HINGE	CB179 4.5 X 4.5 (NRP AT OUTSWING LOCKED OPNGS)	652	STN
1	EA	LOCKSET	45H0D14H (STOREROOM)	626	BST
1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG
1	EA	OVERHEAD STOP	9020 SERIES X 90541 AJB (STOP ONLY - MOUNT PULL SIDE)	S1	ABH
1	EA	PROTECTION PLT	KA050 34" X 2" LDW B4E/CSK (ARMOR - PUSH SIDE)	630	TRM
3	EA	SILENCER	1229A (HM FRAME)	GREY	TRM

HARDWARE SET # 26.0 - GENERATOR RM, MECHANICAL/ELECTRICAL (3070/HMDXHMF/800 AMPS)

DOOR(S): C122A, C123B,

EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
1	EA	CONTINUOUS HGE	651HD X LAR	630	STN
1	EA	RIM EXIT DEVICE	3RO 2103 X V4903 D STOREROOM/VANDEL RESISTANT TRIM)	626W	BST
1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG
1	EA	CLOSER	CLD-4550 CS SN (MOUNT PARALLEL ARM - PUSH SIDE)	689	SDC
1	EA	PROTECTION PLT	KO050 10" X 2" LDW B4E/CSK (KICK - PUSH SIDE)	630	TRM
1	EA	HD FLOOR STOP/HOLD	1209HAHO (HOLD OPEN) (MOUNT AT MAX SWING OF CLOSER)	630	TRM
1	EA	SEAL	5050C X LAR (HEAD/JAMBS)	CHAR	NGP
1	EA	SWEEP	601 A X LAR	A	NGP
1	EA	THRESHOLD	513 X LAR X 1/4-20 SS MSEA	A	NGP

HARDWARE SET # 27.0 - GENERATOR RM, MECHANICAL/ELECTRICAL (2-3070/HMDXHMF/800 AMPS)

DOOR(S): C122B, C123A,

EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
2	EA	CONTINUOUS HGE	651HD X LAR	630	STN
1	EA	K/R MULLION	KR822 X LAR (KEYED/REMOVABLE)	600	PHI
1	EA	CYLINDER	RIM TO MATCH EXISTING SYSTEM (MULLION)	626	SLG
2	EA	RIM EXIT DEVICE	3RO 2101 (EXIT ONLY)	626W	BST
2	EA	CLOSER	CLD-4550 CS SN (MOUNT PARALLEL ARM - PUSH SIDE)	689	SDC
2	EA	PROTECTION PLT	KO050 10" X 1" LDW B4E/CSK (KICK - PUSH SIDE)	630	TRM
2	EA	HD FLOOR STOP/HOLD	1209HAHO (HOLD OPEN) (MOUNT AT MAX SWING OF CLOSER)	630	TRM
1	EA	SEAL	5050C X LAR (HEAD/JAMBS)	CHAR	NGP
2	EA	SWEEP	601 A X LAR	A	NGP
1	EA	HD THRESHOLD	626HD X LAR X 1/4-20 SS MSEA	A	NGP

HARDWARE SET # 28.0 - MEZZ STAIR TO MECH/ELECT (3070/SCWDXHMF/UL)

DOOR(S): C123C,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
3	EA	HINGE	CB179 4.5 X 4.5 (NRP AT OUTSWING LOCKED OPNGS)	652	STN
1	EA	LOCKSET	45H0D14H (STOREROOM)	626	BST
1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG
1	EA	CLOSER	CLD-4550 SN (MOUNT REGULAR ARM - PULL SIDE)	689	SDC
1	EA	PROTECTION PLT	KO050 10" X 2" LDW B4E/CSK (KICK - PUSH SIDE)	630	TRM
1	EA	WALL STOP	1270CX (CONVEX)	626	TRM
1	EA	SEAL	5050C X LAR (HEAD/JAMBS)	CHAR	NGP

HARDWARE SET # 29.0 - MEZZ MECHANICAL ACCESS (2-3070/SCWDXHMF)

DOOR(S): C200A,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
6	EA	HINGE	CB179 4.5 X 4.5 (NRP AT OUTSWING LOCKED OPNGS)	652	STN
2	EA	FLUSHBOLT	3917-12	626	TRM
1	EA	DUST PROOF STK	3910	630	TRM
1	EA	DEADLOCK	48H0L (CYLINDER MEZZ SIDE/BLANK O/S)	626	BST
1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG
2	EA	OVERHEAD STOP	9030 SERIES (FRICTION HOLD)	S1	ABH
1	SET	ASTRAGAL	137NA X 2 PCS LAR (MOUNT ON PULL SIDE)	A	NGP
2	EA	SILENCER	1229A (HM FRAME)	GREY	TRM

HARDWARE SET # 30.0 - CORRIDOR ENTRY/EXIT (2-3070HMDXHMF/AC)

DOOR(S): D100A, E100A, F100B, G100A,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
2	EA	CONTINUOUS HGE	651HD EPT X LAR	630	STN
2	EA	PWR TRANSFER	EPT-12C X 10/24GA.	628	PHI
1	EA	K/R MULLION	KR822 X LAR (KEYED/REMOVABLE)	600	PHI
1	EA	CYLINDER	RIM TO MATCH EXISTING SYSTEM (MULLION)	626	SLG
1	EA	RIM EXIT DEVICE	3RO TS MLR 2103 CD SNB X 4903D SNB (STOREROOM, LATCH RETRACTION, CYLINDER DOGGING)	626W	PHI
1	EA	CYLINDER	RIM TO MATCH EXISTING SYSTEM (MULLION)	626	SLG
1	EA	RIM EXIT DEVICE	3RO TS 2102 CD SNB X 4902D SNB (DUMMY TRIM, CYLINDER DOGGING)	626W	PHI
2	EA	CYLINDER	1-1/4" MORTISE TO MATCH EXISTING SYSTEM (CYLINDER DOGGING)	626	SLG
2	EA	CLOSER	CLD-4550 CS SN (MOUNT PARALLEL ARM - PUSH SIDE)	689	SDC
2	EA	PROTECTION PLT	KO050 10" X 1" LDW B4E/CSK (KICK - PUSH SIDE)	630	TRM
2	EA	HD FLOOR STOP	1209 (MOUNT AT MAX SWING OF CLOSER)	630	TRM
1	EA	MULLION SEAL	5100N X LAR	BLK	NGP
1	EA	SEAL	5050C X LAR (HEAD/JAMBS)	CHAR	NGP
2	EA	SWEEP	601 A X LAR	A	NGP
1	EA	THRESHOLD	513 X LAR X 1/4-20 SS MSEA	A	NGP
1	EA	AC READER	PROVIDED BY OTHER SECTIONS	N/A	B/O

OPERATIONAL NARRATIVE:

VALID CREDENTIAL AT AC READER RETRACTS LATCHBOLT AT DEVICE ALLOWING INGRESS.

FREE EGRESS AT ALL TIMES.

DEVICE HAS "TS" FOR MONITORING AS REQUEST TO EXIT FOR ACCESS CONTROL SYSTEM ALARM SHUNT.

HARDWARE SET # 31.0 - OUTDOOR STORAGE, UTILITY (2-3070/HMDXHMF)

DOOR(S): D101A, D117.1B, E115.1B, G115.1B,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
6	EA	HINGE	CB191 4.5 X 4.5 (NRP AT OUTSWING LOCKED OPNGS)	630	STN
2	EA	FLUSHBOLT	3917-12	630	TRM
1	EA	DUST PROOF STK	3910	630	TRM
1	EA	LOCKSET	45H0D14H (STOREROOM)	630	BST
1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG
2	EA	OVERHEAD STOP	N9030 SERIES (FRICTION HOLD)	630	ABH
2	EA	HD FLOOR STOP/HOLD	1209HAHO (HOLD OPEN) (MOUNT AT MAX SWING OF CLOSER)	630	TRM
1	SET	ASTRAGAL	137NA X 2 PCS LAR (MOUNT ON PULL SIDE)	A	NGP
1	EA	SEAL	5050C X LAR (HEAD/JAMBS)	CHAR	NGP
2	EA	SWEEP	601 A X LAR	A	NGP
1	EA	THRESHOLD	513 X LAR X 1/4-20 SS MSEA	A	NGP

HARDWARE SET # 32.0 - EQUIPMENT STORAGE RM (4070/SCWDXHMF/UL)

DOOR(S): D102.1A,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
1	EA	CONTINUOUS HGE	651HD X LAR	630	STN
1	EA	LOCKSET	45H0D14H (STOREROOM)	626	BST
1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG
1	EA	CLOSER	CLD-4550 SN (MOUNT REGULAR ARM - PULL SIDE)	689	SDC
1	EA	PLUNGER STOP/HOLD	1255 (MOUNT PULL SIDE)	626	TRM
1	EA	PROTECTION PLT	KO050 10" X 2" LDW B4E/CSK (KICK - PUSH SIDE)	630	TRM
1	EA	PROTECTION PLT	KO050 6" X 6" LDW B4E/CSK (MOP - PULL SIDE) (DO NOT MOUNT PLUNGER STOP/HOLD ON PROTECTION PLATE)	630	TRM
1	EA	WALL STOP	1270CX (CONVEX)	626	TRM
1	EA	SEAL	5050C X LAR (HEAD/JAMBS)	CHAR	NGP

HARDWARE SET # 33.0 - LEAD CUSTODIAN OFFICE (3070/SCWDXHMF/UL)

DOOR(S): D102A,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
3	EA	HINGE	CB179 4.5 X 4.5 (NRP AT OUTSWING LOCKED OPNGS)	652	STN
1	EA	LOCKSET	45H0A14H (OFFICE/ENTRY)	626	BST
1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG
1	EA	CLOSER	CLD-4550 SN (MOUNT REGULAR ARM - PULL SIDE)	689	SDC
1	EA	WALL STOP	1270CX (CONVEX)	626	TRM
1	EA	SEAL	5050C X LAR (HEAD/JAMBS)	CHAR	NGP

HARDWARE SET # 34.0 - STORAGE (3070/SCWDXHMF/UL)

DOOR(S): D103A,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
3	EA	HINGE	CB179 4.5 X 4.5 (NRP AT OUTSWING LOCKED OPNGS)	652	STN
1	EA	LOCKSET	45H0D14H (STOREROOM)	626	BST
1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG
1	EA	CLOSER	CLD-4550 SN (MOUNT REGULAR ARM - PULL SIDE)	689	SDC
1	EA	WALL STOP	1270CX (CONVEX)	626	TRM
1	EA	SEAL	5050C X LAR (HEAD/JAMBS)	CHAR	NGP

HARDWARE SET # 35.0 - CLASSROOM (3070/SCWDXHMF/UL)

DOOR(S): D105A, E101A, E102A, E103A, G101A,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
3	EA	HINGE	CB179 4.5 X 4.5 (NRP AT OUTSWING LOCKED OPNGS)	652	STN

1	EA	LOCKSET	45H0IND14H VIT (INTRUDER W/INDICATOR THUMBTURN)	626	BST
1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG
1	EA	CLOSER	CLD-4550 SN (MOUNT REGULAR ARM - PULL SIDE)	689	SDC
1	EA	WALL STOP	1270CX (CONVEX)	626	TRM
1	EA	SEAL	5050C X LAR (HEAD/JAMBS)	CHAR	NGP

HARDWARE SET # 36.0 - PREP ROOM, KILN (3070/SCWDXHMF)

DOOR(S): D105.1A, E102.1A,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
3	EA	HINGE	CB179 4.5 X 4.5 (NRP AT OUTSWING LOCKED OPNGS)	652	STN
1	EA	LOCKSET	45H0R14H (CLASSROOM)	626	BST
1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG
1	EA	WALL STOP	1270CX (CONVEX)	626	TRM
3	EA	SILENCER	1229A (HM FRAME)	GREY	TRM

HARDWARE SET # 37.0 - CENTRAL RECEIVING, TECH RM, BROADCAST STUDIO (4070/SCWDXHMF)

DOOR(S): D106A, F101A, F102A, F103A, F103B,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
1	EA	CONTINUOUS HGE	651HD X LAR	630	STN
1	EA	LOCKSET	45H0D14H (STOREROOM)	626	BST
1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG
1	EA	CLOSER	CLD-4550 SN (MOUNT PARALLEL ARM - PUSH SIDE)	689	SDC
1	EA	PLUNGER STOP/HOLD	1255 (MOUNT PULL SIDE)	626	TRM
1	EA	PROTECTION PLT	KO050 10" X 2" LDW B4E/CSK (KICK - PUSH SIDE)	630	TRM
1	EA	PROTECTION PLT	KO050 6" X 6" LDW B4E/CSK (MOP - PULL SIDE) (DO NOT MOUNT PLUNGER STOP/HOLD ON PROTECTION PLATE)	630	TRM
1	EA	WALL STOP	1270CX (CONVEX)	626	TRM

3	EA	SILENCER	1229A (HM FRAME)	GREY	TRM

HARDWARE SET # 38.0 - CENTRAL RECEIVING EXTERIOR (2-3070/HMDXHMF)

DOOR(S): D106B,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
2	EA	CONTINUOUS HGE	651HD X LAR	630	STN
2	EA	FLUSHBOLT	3917-12	630	TRM
1	EA	DUST PROOF STK	3910	630	TRM
1	EA	LOCKSET	45H0D14H (STOREROOM)	630	BST
1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG
1	EA	CLOSER	CLD-4550 CS SN (MOUNT PARALLEL ARM - PUSH SIDE) (ACTIVE LEAF ONLY)	689	SDC
1	EA	OVERHEAD STOP	N9010 SERIES (HOLD)	630	ABH
1	EA	HD FLOOR STOP/HOLD	1209HAHO (HOLD OPEN) (MOUNT AT MAX SWING OF CLOSER) (ACTIVE LEAF)	630	TRM
1	SET	ASTRAGAL	137NA X 2 PCS LAR (MOUNT ON PULL SIDE)	A	NGP
1	EA	SEAL	5050C X LAR (HEAD/JAMBS)	CHAR	NGP
2	EA	SWEEP	601 A X LAR	A	NGP
1	EA	THRESHOLD	513 X LAR X 1/4-20 SS MSEA	A	NGP

HARDWARE SET # 39.0 - CLASSROOM MECHANICAL (2-2680/SCWDXHMF)

DOOR(S): D107.1A, D108.1A, D109.1A, D110.1A, D111.1A, D112.1A, D113.1A, D114.1A, D120.1A, D121.1A, D122.1A, D123.1A, E104.1A, E106.1A, E107.1A, E108.1A, E109.1A, E111.1A, E114.1A, E116.1A, E118.1A, E119.1A, E121.1A, E123.1A, G105.1A, G106.1A, G107.1A, G108.1A, G109.1A, G110.1A, G111.1A, G112.1A, G118.1A, G119.1A, G120.1A, G121.1A,

EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
8	EA	HINGE	CB179 4.5 X 4.5 (NRP AT OUTSWING LOCKED OPNGS)	652	STN
2	EA	FLUSHBOLT	3917-12	630	TRM
1	EA	DUST PROOF STK	3910	630	TRM
1	EA	LOCKSET	45H0D14H (STOREROOM)	626	BST

1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG
2	EA	OVERHEAD STOP	9010 SERIES (HOLD)	S1	ABH
3	EA	SILENCER	1229A (HM FRAME)	GREY	TRM

HARDWARE SET # 40.0 - ELECTRICAL (3070/SCWDXHMF)

DOOR(S): E105A,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
1	EA	CONTINUOUS HGE	651HD X LAR	630	STN
1	EA	RIM EXIT DEVICE	3RO 2103 SNB X 4903D SNB (STOREROOM)	626W	PHI
1	EA	CYLINDER	RIM TO MATCH EXISTING SYSTEM	626	SLG
1	EA	ELECTRIC STRIKE	BES-0563LM	630	BST
1	EA	CLOSER	CLD-4550 CS SN (MOUNT PARALLEL ARM - PUSH SIDE)	689	SDC
1	EA	PROTECTION PLT	KO050 10" X 2" LDW B4E/CSK (KICK - PUSH SIDE)	630	TRM
3	EA	SILENCER	1229A (HM FRAME)	GREY	TRM
1	EA	AC READER	PROVIDED BY OTHER SECTIONS	N/A	B/O

OPERATIONAL NARRATIVE:

VALID CREDENTIAL AT AC READER RELEASES ELECTRIC STRIKE ALLOWING INGRESS.

FREE EGRESS AT ALL TIMES.

HARDWARE SET # 41.0 - MEDIA CENTER (3070/SCWDXHMF)

DOOR(S): F100A,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
3	EA	HINGE	CB179 4.5 X 4.5 (NRP AT OUTSWING LOCKED OPNGS)	652	STN
1	EA	RIM EXIT DEVICE	3RO 2108 SNB X 4908D SNB (CLASSROOM)	626W	PHI
1	EA	CYLINDER	RIM TO MATCH EXISTING SYSTEM	626	SLG

1	EA	CLOSER	CLD-4550 EDA SN (MOUNT PARALLEL ARM - PUSH SIDE)	689	SDC
1	EA	PROTECTION PLT	KO050 10" X 2" LDW B4E/CSK (KICK - PUSH SIDE)	630	TRM
1	EA	FLOOR STOP	1215CKU	626	TRM
3	EA	SILENCER	1229A (HM FRAME)	GREY	TRM

HARDWARE SET # 42.0 - ELECTRICAL (3070/SCWDXHMF/UL)

DOOR(S): G102A,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
1	EA	CONTINUOUS HGE	651HD X LAR	630	STN
1	EA	RIM EXIT DEVICE	3RO FL2103 SNB X 4903D SNB (STOREROOM)	626W	PHI
1	EA	CYLINDER	RIM TO MATCH EXISTING SYSTEM	626	SLG
1	EA	CLOSER	CLD-4550 EDA SN (MOUNT PARALLEL ARM - PUSH SIDE)	689	SDC
1	EA	PROTECTION PLT	KO050 10" X 2" LDW B4E/CSK (KICK - PUSH SIDE)	630	TRM
1	EA	WALL STOP	1270CX (CONVEX)	626	TRM
1	EA	SEAL	5050C X LAR (HEAD/JAMBS)	CHAR	NGP

HARDWARE SET # 43.0 - CLASSROOM (3070/SCWDXHMF)

DOOR(S): G105A, G106A, G107A, G108A, G109A, G110A, G111A, G112A, G118A, G119A, G120A, G121A,

EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
3	EA	HINGE	CB179 4.5 X 4.5 (NRP AT OUTSWING LOCKED OPNGS)	652	STN
1	EA	RIM EXIT DEVICE	3RO 2108 X 4908 D SNB (CLASSROOM)	626	BST
1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG
1	EA	CLOSER	CLD-4550 SN (MOUNT REGULAR ARM - PULL SIDE)	689	SDC
1	EA	WALL STOP	1270CX (CONVEX)	626	TRM
3	EA	SILENCER	1229A (HM FRAME)	GREY	TRM

HARDWARE SET # MISCELLANEOUS MATERIAL

DOOR(S): MISC,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
1	EA	KEY CABINET	2018-XX-003 SERIES X 150% CAPACITY	N/A	MMF
1	EA	KNOX BOX	3200 SERIES	BLK	KNX

ADD ALTERNATE #1

HARDWARE SET # A01.0 - CLASSROOM ENTRY/EXIT (3070/SCWDXHMF)

DOOR(S): D124A, D125A, E120A, E125A,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
3	EA	HINGE	CB179 4.5 X 4.5 (NRP AT OUTSWING LOCKED OPNGS)	652	STN
1	EA	LOCKSET	45H0IND14H VIT (INTRUDER W/INDICATOR THUMBTURN)	626	BST
1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG
1	EA	WALL STOP	1270CX (CONVEX)	626	TRM
3	EA	SILENCER	1229A (HM FRAME)	GREY	TRM

HARDWARE SET # A02.0 - CLASSROOM MECHANICAL (2-2680/SCWDXHMF)

DOOR(S): D124.1A, D125.1A, E120.1A, E125.1A, G124.1A, G125.1A,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
8	EA	HINGE	CB179 4.5 X 4.5 (NRP AT OUTSWING LOCKED OPNGS)	652	STN
2	EA	FLUSHBOLT	3917-12	630	TRM
1	EA	DUST PROOF STK	3910	630	TRM
1	EA	LOCKSET	45H0D14H (STOREROOM)	626	BST
1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG

2	EA	OVERHEAD STOP	9010 SERIES (HOLD)	S1	ABH
3	EA	SILENCER	1229A (HM FRAME)	GREY	TRM

HARDWARE SET # A03.0 - TOILET (3070/SCWDXHMF)

DOOR(S): G124.2A, G125.2A,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
3	EA	HINGE	CB179 4.5 X 4.5 (NRP AT OUTSWING LOCKED OPNGS)	652	STN
1	EA	LATCHSET	45H0L14H VIN (PRIVACY W/INDICATOR)	626	BST
1	EA	CLOSER	CLD3550 SN (MOUNT OUT OF PUBLIC VIEW)	626	SDC
1	EA	PROTECTION PLT	KO050 10" X 2" LDW B4E/CSK (KICK - PUSH SIDE)	630	TRM
1	EA	PROTECTION PLT	KO050 6" X 1" LDW B4E/CSK (MOP - PULL SIDE)	630	TRM
1	EA	WALL STOP	1270CX (CONVEX) (AS NEEDED)	626	TRM
3	EA	SILENCER	1229A (HM FRAME)	GREY	TRM

NOTE(S):

MARBLE THRESHOLD BY OTHERS AS NEEDED.

HARDWARE SET # A04.0 - CLASSROOM EXTERIOR ENTRY/EXIT (3070/HMDXHMF)

DOOR(S): G124B, G125B,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
1	EA	CONTINUOUS HGE	651HD X LAR	630	STN
1	EA	RIM EXIT DEVICE	3RO 2103 CD SNB X 4903D SNB (STOREROOM, CYLINDER DOGGING)	626W	PHI
1	EA	CYLINDER	RIM TO MATCH EXISTING SYSTEM (ED TRIM)	626	SLG
1	EA	CYLINDER	1-1/4" MORTISE TO MATCH EXISTING SYSTEM (CYLINDER DOGGING)	626	SLG
1	EA	CLOSER	CLD-4550 CS SN (MOUNT PARALLEL ARM - PUSH SIDE)	689	SDC
1	EA	PROTECTION PLT	KO050 10" X 2" LDW B4E/CSK (KICK - PUSH SIDE)	630	TRM

1	EA	HD FLOOR STOP	1209 (MOUNT AT MAX SWING OF CLOSER)	630	TRM
1	EA	SEAL	5050C X LAR (HEAD/JAMBS)	CHAR	NGP
1	EA	SWEEP	601 A X LAR	A	NGP
1	EA	THRESHOLD	513 X LAR X 1/4-20 SS MSEA	A	NGP

HARDWARE SET # A05.0 - CLASSROOM ENTRY/EXIT (3070/SCWDXHMF)

DOOR(S): G124A, G125A,
EACH TO HAVE:

QTY	UNIT	PRODUCT	DESCRIPTION	FINISH	MFG
3	EA	HINGE	CB179 4.5 X 4.5 (NRP AT OUTSWING LOCKED OPNGS)	652	STN
1	EA	RIM EXIT DEVICE	3RO 2108 X 4908 D SNB (CLASSROOM)	626	BST
1	EA	CYLINDER	MORTISE X CAM X MATCH EXISTING SYSTEM	626	SLG
1	EA	CLOSER	CLD-4550 SN (MOUNT REGULAR ARM - PULL SIDE)	689	SDC
1	EA	WALL STOP	1270CX (CONVEX)	626	TRM
3	EA	SILENCER	1229A (HM FRAME)	GREY	TRM

END OF SECTION 08 71 00

DIVISION 08

SECTION 08 71 30: WEATHERSTRIPPING

08 71 30.01: GENERAL

A. SCOPE

1. Furnish all labor, materials and equipment necessary to complete the weather-stripping of all exterior doors.

2. Weatherstripping for aluminum and glass doors will be furnished by the door manufacturer.

08 71 30.02: PRODUCTS

A. WEATHERSTRIPPING

1. Fasten weatherstripping to doors with brass-plated sheet metal screws.

B. DELIVERY AND STORAGE

1. All items shall arrive at the job site packed and marked for easy reference. Store material under cover in a manner that will prevent theft or damage.

08 71 30.03: EXECUTION

A. INSTALLATION

1. Install all items level, square, in proper alignment and in proper relationship to all adjoining work. Set all thresholds in a full bed of caulking; anchor with 1/4" machine screws and expansion or lead shields. At points where aluminum comes in contact with steel, prime the steel first with asphalt paint before attaching aluminum members.

DIVISION 08

SECTION 08 80 00: GLASS AND GLAZING

08 80 00.01: GENERAL

A. SCOPE

1. Furnish all labor, materials, appliances and equipment necessary for completion of all glazing work, including all supplementary parts necessary for a complete installation, as shown on the drawings, herein specified, or both, as follows:

    a. Glazing of windows.
    b. Glazing of doors and partitions.
    c. Glazing of storefronts and curtainwalls.
    d. Plate glass mirrors except mirrors over lavatories (See SECTION 10 28 13.13).

2. Shop drawings required.

B. WORK NOT INCLUDED

1. If in the opinion of the glass manufacturer there will be the probability of glass breakage due to the following possible causes, the Architect shall be notified in writing before bid date:

    a. Thermal shock.
    b. Shade and/or shadow on glass.
    c. Sunshine on glass.
    d. Glass directly exposed to interior heating and/or cooling.
    e. Area between drapes and/or curtains and glass.
    f. Installation details.
    g. Sealants.
    h. Vibration from truck and street traffic.
    i. Any other condition or situation that could cause breakage other than abuse, vandalism and/or natural disaster.

C. INSTALLATION

1. Prior to glazing, all dirt, film, protective coatings, moisture, etc. shall be removed from glazing surfaces and glass; and glazing surfaces shall be treated as recommended by manufacturer of glazing material.

2. Except as otherwise specified or required, glazing clearances shall conform to the requirements specified herein. Glass shall be set to float free of all contact with sash or frame but shall be cut to size that will assure lap on all edges; glass clearances at perimeter on all four sides shall be not less than the thickness of glass to be installed. There shall be no metal to glass contact.

3. The sizes of glass indicated on the drawings are approximate only and the actual sizes required shall be determined by measuring the frames to receive the glass. Labels shall not be removed until final approval by the Architect.

4. All operable sash shall be glazed in closed position, and sash shall not be handled or operated until glazing compound has set.

5. After installation, glass shall be protected as necessary during all subsequent construction operations. Any glass which is chipped, cracked or scratched shall be replaced.

6. Upon completion of construction, all glass shall be cleaned to crystal clarity using a mild soap and water or other cleaning agents which will cause no damage to glass or adjacent surfaces.

08 80 00.02: GLAZING MATERIALS

A. GENERAL

1. Glazing compound shall not be altered with any other sealer or solvent, nor combined or cut with any material without approval of manufacturer.

2. All glass shall be factory labeled on each pane, and labels shall remain on glass until final cleaning. Manufacturer's label shall show strength, grade, thickness, type and quality of glass.

B. MATERIALS & LOCATION

1. All glass shall be similar and equal to the products of PPG Industries, Saint-Gobain or The NSG Group. Trade names listed herein denote grade, type and quality of materials required.

   a. Glass for aluminum storefronts and curtainwalls will be 1" insulating glass with air space to suit thickness of glass specified. Glass adjacent to doors and within 18" of the floor in storefront and curtain walls shall be 1/4" Tuf-flex clear tempered float glass. Glass for aluminum-clad windows shall be 5/8" overall thickness.
   b. Glass for aluminum windows shall be two panes of 1/8" double strength clear float glass. The glass for the insulated sections in the storefront and curtain wall shall be two panes of 1/4" clear float glass except as specified below.
   c. Glass for glazed exterior doors will be 1/4" Tuf-Flex clear tempered float glass.
   d. Glass for interior partitions will be as shown on the drawings:

      1) Glass adjacent to doors and floors to be 1/4" Tuf-flex tempered float glass.
      2) Other glass to be 7/32" clear float glass.

   e. Glass for interior doors shall be D.S.B. unless otherwise noted.
   f. Mirrors specified in SECTION 10 28 13.13.

08 80 00.03: INSTALLATION

A. Glass shall be centered in openings using setting blocks and centered shims as required, and centered position shall be maintained throughout glazing operations.

1. Windows glazing beads shall have a minimum wall thickness of .050" and shall be the interlocking type requiring no screws. Glazing shall be accomplished using continuous extruded Poly-vinyl gaskets and requiring no mastic or glazing compounds.

2. Glazing of windows, doors, sidelight, etc. shall be accomplished neatly.

3. Adequate protection shall be provided during fabrications, shipment, site storage and erection, to prevent damage of finished work.

4. The mirrors shall be securely attached to the wall with concealed fastener, edge clips and cement.

DIVISION 09

SECTION 09 21 00: GYPSUM DRYWALL

09 21 00.01: GENERAL

A. SCOPE

1. The work covered by this section of the specifications consists of furnishing all plant, labor, materials, appliances, equipment, scaffolding, etc., in connection with the complete installation, ready for use, of the items specified herein, in strict accordance with this section of the specifications, the general conditions, and the applicable drawings.

09 21 00.02: PRODUCTS

A. MATERIALS

1. Gypsum drywall shall be 1/2" and/or 5/8" thick, 48" wide tapered edge fire code wallboard in lengths as required. Certain areas may require Type X drywall (acceptable manufacturers are Georgia Pacific, American Gypsum and USG), refer to wall types on drawings. Provide casing beads where required. Use moisture resistant panels for exterior and in wet locations. Gold Bond or equal MR Board on interior and Soffit Board on exterior.

2. Screw Fasteners shall be 1-1/8" self-drilling cadmium-plated screws for wallboard application to metal studs.

3. Nail fasteners (where approved by Architect) shall be located 3/8" minimum to 1/2" maximum from edges and ends of wallboard at 8" o.c. on walls. The nails shall be driven home with the heads slightly below the surface of the board in a dimple formed by the driving tool. Improperly driven nails shall be removed.

4. Joint system shall consist of a perforated fiber tape and joint compound as recommended by the wallboard manufacturer. The system shall conform to ASTM C474 and C475 and Federal Specification SS-J-570A, Type III for combined joint compound and tape.

5. All gypsum drywall materials and accessories shall be the products of a single nationally recognized and reputable manufacturer.

6. Corner beads shall be galvanized steel 1" x 1".

7. Casing beads and trim shall be galvanized steel.

8. All exposed gypsum corners shall have vinyl corner guards – equal to Thinline model CG-2157 by AFCO, length 8’-0” from the finish floor. Note: “wing walls” will have corner guards on the most exposed corner(s).

B. DELIVERY AND STORAGE

1. All material shall be delivered to the job site in original unopened bundles or cartons bearing the manufacturer's label. Store material under roof, elevated above floor. Gypsum wallboard shall remain dry at all times.

09 21 00.03: EXECUTION

A. INSTALLATION:

1. Gypsum drywall will be installed in well ventilated, totally enclosed areas, with temperatures uniformly maintained within the range of 55° F to 70° F. Maintain temperature until building is occupied.

2. Gypsum wallboard shall be applied at right angles to framing members. Boards of maximum practical length shall be used so that an absolute minimum number of end joints occur. Boards shall be brought into contact with each other but shall not be forced into place. Wallboard joints at opening shall be located so that no end joint will align with edge of opening. End joints shall be staggered and joints on opposite sides of a partition shall not fall on the same stud. The application shall be in strict accordance with the specifications of the wallboard manufacturer. Keep a copy of the manufacturer's specifications on the job site during this operation.

3. Wallboard shall be cut neatly to fit around all outlets and switch boxes. The final work shall be plane with no dimples or arises. All walls shall be plumb, true and secure.

4. Joint compound and perforated tape shall be used on all face joints and internal angles formed by the intersections of walls. Final application of joint compound will be sanded smooth. Apply compound in three coats, sanding between coats.

5. Provide metal trim, corner beads, and control joints as shown on the drawings and/or as required, in single lengths. At least two coats of joint compound shall be applied over beads and each coat feathered out approximately 9" on both sides onto panel faces.

6. Joint Treatment:

   a. Prefill: Fill open spaces between boards of 1/4" or more with taping compound. Allow to harden prior to application of taping coat.
   b. Taping:
      1) Apply a thin uniform layer of compound to joints and angles to be reinforced. Provide sufficient compound under tape, approximately 1/64" to 1/32" for proper bond. Immediately apply tape, center over joint and seat into the compound. Apply skim coat immediately following tape embedment.
      2) Fold tape and embed in angles to provide a true angle.
      3) Allow to harden prior to application of fill coat.

c. Filling coat:

1) Apply compound over taping skim coat.
2) Fill board taper flush with the surface.
3) On non-tapered joints, apply compound over the tape and feather out at least 4" on either side of the joint.
4) Do not apply filling coat to interior angles.
5) Allow to dry thoroughly prior to application of finish coat.

d. Finishing:

1) Apply compound evenly over and extending slightly beyond the fill coat on all joints.
2) Feather to a smooth, uniform finish. Over tapered edges, the finished joint shall not protrude beyond the plane of the surface.
3) Apply compound at taped angles to provide a true angle.
4) Exposed walls will have "Knock Down" finish.

7. Fastener Depressions:

Apply a minimum of three coats of compound, allowing each coat to dry or harden prior to application of the following coat. Leave finish level with the plane of the surface.

8. Metal Accessories:

a. Apply a minimum of three coats of compound, allowing each coat to dry or harden prior to application of the following coat.
b. Feather out from the ground to the plane of the surface, each coat slightly beyond the preceding coat.

9. Sanding:

a. Sand where necessary between coats and following the final application of compound to provide a flat, smooth surface ready for decoration.

10. Fire/Smokestop Walls:

a. All rated fire walls and smokestop walls shall be permanently identified. Each rated wall shall be identified by a sign or stenciling, no further than 12'-0"o.c. above the finished ceiling. The wording should read: "1 hr. (2 hr., 3 hr., 4 hr.) rated fire/smoke wall; protect all openings and penetrations".

DIVISION 09

SECTION 09 30 13: CERAMIC TILE & PORCELAIN TILE

09 30 13.01: GENERAL

A. SCOPE

1. The work covered by this section of the specifications consists of furnishing all plant, labor, equipment, materials, appliances, scaffolding, etc., in connection with the complete installation, ready for use, of the items specified herein, in strict accordance with this section of the specifications, the general conditions, the applicable drawings, and schedule. Install all ceramic tile as specified and shown on drawings and mentioned in schedule. All items under this section shall be furnished, installed, and left in perfect condition.

B. SUBMITTALS

1. Submit manufacturer's information on each material proposed for use. Obtain approval of materials prior to placing orders.

2. Submit samples, in duplicate, of each color and type of tile specified.

3. Submit master grade certificates for each standard grade of tile.

09 30 13.02: PRODUCTS

A. TILE

1. Tile for floors and walls where called for on the documents shall be 2" X 2", 6"x6" or 12"x12" square ceramic or porcelain tile American Olean (Group 4 & 20), Daltile (Group 4 & 5) or approved equal to conform to ANSI A137.1-89. Cove Base, inside and outside corners must match tile. Submit actual samples proposed for the project to the architect, per submittal section within these specifications.

B. MARBLE THRESHOLDS

1. Marble thresholds shall be honed Italian marble free from cracks, chips, stains or other defects; shape shall be as detailed on the drawings. Thresholds shall be uniform in tone and coloring as selected by the Architect.

C. SETTING MATERIALS

1. Portland cement shall conform to ASTM C-150, Type I.

2. Sand shall conform to ASTM C-144.

3. Water shall be clean and free of deleterious amount of acids, alkalis, salts or organic matter.

4. Dry-set mortar shall conform to ANSI A118.4.

5. Latex-Portland cement mortar shall conform to ANSI A118.4.

D. GROUTING MATERIALS

1. Grout for floor tile shall be commercial Stainless Epoxy type. Color shall be selected by the Architect.

2. Grout for base shall be latex-Portland cement type. Color shall be selected by the Architect.

E. DELIVERY AND STORAGE

1. Deliver all materials in manufacturer's original sealed containers with all seals and labels intact and legible.

2. Store materials under cover in a manner to prevent damage or contamination.

09 30 13.03: EXECUTION

A. LAYING OUT WORK

1. The room or other areas shall be measured and centered, the lines for borders established where these occur, and the field work centered in both directions by lines that will permit the pattern to be laid with a minimum number of cut tiles. Floors shall be laid from some suitable central point outward so that all major adjustments required will be made at walls.

B. PREPARATION

1. Examine all surfaces to receive tile for defects or conditions adversely affecting the quality and execution of tile installation.

2. Surfaces to receive tile shall be firm, dry, clean and free of oily or waxy films.

3. Grounds, anchors, plugs, hangers, bucks, electrical and mechanical work in or behind tile shall be installed prior to beginning tile work.

4. Do not proceed with tile installation until all unsatisfactory conditions are corrected.

C. INSTALLATION METHODS

1. Floor shall be installed using Tile Council of America (TCA) method F132 – Thickset (refer to plans for areas with slab depressions) or TCA method F131 - Thinset. Walls – System W242.

2. Base shall be installed using TCA method W213.

D. EXECUTION

1. Prepare surface; fit, set or bond, grout and clean tile in accordance with applicable ANSI standards for setting method specified. Tile shall be neatly cut with no ragged edges.

2. Install edge strips and marble thresholds where tile floors are adjacent to other flooring materials or where indicated on the Door Schedule.

3. Tile shall be cleaned as recommended by the manufacturer and shall be protected with one layer of Kraft paper. No acid shall be used in cleaning the tile. All work upon completion shall be protected from damage by other workmen.

4. Tile work that does not meet the requirements of these specifications will not be accepted until corrected to the satisfaction of the Architect. All materials and workmanship shall produce first-class results. All tile shall be set by experienced tile setters.

DIVISION 09

SECTION 09 30 16: QUARRY TILE

09 30 16.01: GENERAL

A. SCOPE

1. The work covered by this section of the specifications consists of furnishing all plant, labor, equipment, materials, appliances, scaffolding, etc., in connection with the complete installation, ready for use, of the items specified herein, in strict accordance with this section of the specifications, the general conditions, the applicable drawings, and schedule. Install all tile as specified and shown on drawings, and schedule. Install all tile as specified and shown on drawings and mentioned in schedule. All items under this section shall be furnished, installed, and left in perfect condition.

B. SUBMITTALS

1. Submit manufacturer's information on each material proposed for use. Obtain approval of materials prior to placing orders.

2. Submit samples, in duplicate, of each color and type of tile specified.

3. Submit master grade certificate for each standard grade of tile.

09 30 16.02: PRODUCTS

A. TILE

1. Quarry tile shall be nominal 6" x 6" x 1/2" American Olean, Metropolitan Ceramics or approved equal, non-absorbent, unglazed quarry tile with square edges conforming to TCA 137.1. Color shall be selected by the Architect. Kitchen areas to have "sure step", "metrotread" or equal.

2. Base shall be 5" x 6" x 1/2" cove base with round top. Provide other trim pieces as required. Colors will be selected by the Architect.

B. SETTING MATERIALS

1. Portland cement shall conform to ASTM CC-150, Type I.

2. Sand shall conform to ASTM C-144 and shall be clean, washed, sharp, durable, fine aggregate, free from silt, loam, clay, soluble salts and organic impurities. Sand for setting beds of floors and base coats for walls shall be well graded, passing a No. 8 sieve, with not more than five percent passing a 100 mesh screen. Sand for grout shall be screened to pass a 30 mesh sieve, with not more than five percent passing a 100.

3. Water shall be clean and free of deleterious amounts of acids, alkalis, salts or organic matter.

4. Epoxy mortar shall conform to ANSI A118.3.

5. Latex Portland cement mortar shall conform to ANSI 118.4.

C. GROUTING MATERIALS

1. Grout for quarry tile and base shall be epoxy type, ANSI 118.3. Color shall be selected by the Architect.

D. DELIVERY AND STORAGE

1. Deliver all materials in manufacturer's original sealed containers with all seals and labels intact and legible.

2. Store materials under cover in a manner to prevent damage or contamination.

09 30 16.03: EXECUTION

A. PREPARATION

1. Examine all surfaces to receive tile for defects of conditions adversely affecting the quality and execution of tile installation. Do not proceed with tile installation until all unsatisfactory conditions are corrected.

2. Surfaces to receive tile shall be firm, dry, clean and free of oily or waxy films.

3. Grounds, anchors, plugs, hangers, supports, electrical and mechanical work in or behind tile shall be installed prior to beginning tile work.

B. INSTALLATION METHODS

1. Mortar and grout shall be approved by the tile manufacturer for the intended use.

2. The installation of the tile shall be in conformance with ANSI A108.6. Slope floors to drains as shown on the drawings.

C. EXECUTION

1. Prior to the spreading of setting bed, the room or other areas shall be measured and centered, the lines for borders established where these occur, and the field work centered in both directions by lines that will permit the pattern to be laid with a minimum number of cut tiles. Floors shall be laid from some suitable central point outward so that all major adjustments required will be made at walls.

2. Prepare surface; fit, set or bond, grout and clean tile in accordance with applicable ANSI standards for setting method specified.

3. Install edge strips where tile floors are adjacent to other flooring materials or where indicated on the Door Schedule.

4. Install a quarry tile cove base at all quarry tile floors. Use factory made interior and exterior corners.

5. Tile shall be cleaned as recommended by the manufacturer and shall be protected with one layer of Kraft paper. No acid shall be used in cleaning the tile.

6. Tile work that does not meet the requirements of these specifications will not be accepted until corrected to the satisfaction of the Architect. All materials and workmanship shall produce first-class results. All tile shall be set by experienced tile setters.

7. All tile around kitchen areas shall have epoxy grout.

DIVISION 09

SECTION 09 51 00: SUSPENDED ACOUSTICAL CEILING

09 51 00.01: GENERAL

A. SCOPE

1. Furnish all labor, materials and equipment necessary to complete the acoustical panel ceiling system as indicated on the drawings, called for on the Room Finish Schedule and specified herein.

B. SUBMITTALS

1. Submit brand name and manufacturer of all items proposed for use. Obtain approval by the Architect before placing orders.

2. Submit shop drawings and manufacturer's technical data showing layout indication and installation details.

3. Submit a 12" x 12" sample of the acoustical panel proposed for use.

C. COORDINATION

1. Coordinate all work under this section with other trades to expedite the progress of the project. Provide special framing around recessed items as required.

2. Contractor shall familiarize himself with work by the Mechanical and Electrical Contractors so as to achieve first class results.

09 51 00.02: PRODUCTS

A. MANUFACTURER

1. All materials included in the acoustical panel ceiling system shall be the products of a single nationally recognized and reputable manufacturer, such as CertainTeed, USG or Armstrong.

2. Products mentioned by name in this specification are intended to denote design and finish required.

B. SYSTEM DESCRIPTION

1. Acoustical panel ceiling system shall be mineral-fiberboard, lay-in type. Suspension system shall be hung directly from the structure above. The ceiling used shall be compatible with the floor-ceiling assembly required in each area.

2. All suspended acoustical ceiling tiles in toilets and kitchen areas will be nonabsorbent, washable type that will meet or exceed the requirements of NC Authority G.S. 130A-236 or local governing codes.

C. SUSPENSION MATERIALS

1. Hanger wires shall be pre-straightened, galvanized steel wire.

2. Exposed grid framing shall have a baked white satin enamel finish unless otherwise noted (refer to drawings).

3. Provide hold-down clips on rated ceiling, matching wall moldings, caps and all other accessories required.

D. ACOUSTICAL PANELS

1. Acoustical panels shall be 24" x 24" x 5/8" mineral-fiber, fire guard lay-in units with tegular edges, non-directional pattern, compatible with the UL Design Number indicated on the plans. Refer to the Architectural Reflected Ceiling plans. CertainTeed Ceilings or other approved equal.

E. CEILING ACCESS: DOOR

1. Access door shall be Inryco/Milcor Aluminum Ceiling Access Door Model No. CF-2 or approved equal. Door shall be flush-mounted in ceiling where indicated and shall be 30" x 36" and downward swinging. Key Lockable.

2. Finish shall be painted as per SECTION 09 90 00 – PAINTING and will match ceiling color.

F. DELIVERY, STORAGE AND HANDLING

1. Deliver material in its original, unopened, protective packaging with manufacturer's labels indicating brand name, pattern, size, thickness and fire rating, legible and intact.

2. Store materials in original protective packaging to prevent soiling, physical damage or wetting. Store cartons open at each end to stabilize moisture content and temperature.

3. Do not begin installation until sufficient materials to complete a room are received.

09 51 00.03: EXECUTION

A. CONDITION OF SURFACE

1. Examine surface scheduled to receive suspended or directly attached acoustical units for unevenness, irregularities, and dampness that would affect quality and execution of work.

2. Access provisions (i.e. doors, panels) will be installed before beginning installation.

B. ENVIROMENTAL REQUIREMENTS

1. Complete installation of dampening materials before beginning work.

2. Maintain a uniform humidity of 65% - 75% and temperature in the range of 55° F to 70° F in area where acoustical materials are to be installed, 25 hours before, during, and 25 hours after installation.

C. INSTALLATION

1. Securely attach hangers to structural members above at 48" o.c. each and within 6" of the ends of main runner runs. Provide power driven hanger inserts where ceilings are suspended below structural concrete slabs. Provide additional hanger wires at each corner of recessed light fixtures. Coordinate installation of hanger wires with fire ceiling contractor.

2. Level and secure angle molding to walls and columns as required, using finished angle corner plates at all exterior corners. Erect metal tees in pattern indicated on approved shop drawings. Install main runners at 48" o.c. and cross tees as required, with ends supported by wall molding.

3. Install panels on flanges or inverted tees with panels fitting neatly against abutting surfaces. Field cutting shall be done in a neat and inconspicuous manner with exposed edges sharp and unfrayed.

4. Provide tile for fireproofing over lighting fixtures and assemble fireproofing in accordance with U.L. Design specified.

D. TOLERANCE

1. Suspension system components, hangers and fastening devices supporting light fixtures, ceiling grilles and ceiling panels shall have a mixture deflection of 1/360 of the span and shall be level to within 1/8" in each room.

E. CLEANING

1. Clean soiled or discolored unit surfaces after installation. Touch up scratches, abrasions, voids, and other defects in painted surfaces. Remove and replace damaged or improperly installed units.

F. GUARANTEE

1. Defects in materials and workmanship that occur within one year from date of substantial completion of the project shall be corrected as directed by the Architect. Such defects shall include: noticeable warping, shrinking or sagging or acoustical peeling, and scaling of paint on painted work; rusting of suspension system members.

G. MAINTENANCE MATERIAL

1. Furnish extra materials equal to 1% of each type of acoustical material supplied.

DIVISION 09

SECTION 09 65 00: RESILIENT FLOORING

09 65 00.01: GENERAL

A. SCOPE

1. Furnish all labor, materials and equipment necessary to complete the installation of all vinyl composition tile, synthetic flooring, rubber base, rubber treads and nosings where indicated on the drawings and Room Finish Schedule and as specified herein and the applicable drawings.

B. SAMPLES

1. Provide Architect with adequate samples of each product for selection of pattern, texture, quality and color. Also provide 4 copies of manufacturer's literature which describes products' qualities, installation recommendations and procedures, maintenance requirements and warranties.

09 65 00.02: PRODUCTS

A. VINYL COMPOSITION TILE

1. Vinyl Composition flooring shall conform to ASTM 1066, CLASS 2, ASTM 1700 and SS-T-312B (1), Type IV as made by a nationally recognized and reputable manufacturer. Tile shall be 12" x 12" x 1/8" with patterns and colors to match the existing project. Submit actual samples proposed for the project to the Architect, per submittal section within these specifications. Manufacturers: Armstrong (Preferred Manufacturer), Congoleum, & American Tile.

B. RUBBER TREADS AND NOSINGS

1. Rubber treads and nosings shall be two-piece tread/riser safety design system to match existing. Submit actual samples proposed for the project to the architect, per submittal section within these specifications.

C. RUBBER BASE

1. Rubber base shall be 4"or 6" high, factory-molded, cove style with pre-molded corners, to match the existing. Submit actual samples proposed for the project to the architect, per submittal section within these specifications. Manufacturers: Johnsonite, Inc., Roppe, Allstate and Nora.

D. ADHESIVE

1. Adhesive for flooring and base shall be waterproof-type as recommended by the manufacturer.

E. DELIVERY AND STORAGE

1. Deliver materials to project site in manufacturer's original, unopened containers with labels indicating brand names, colors and patterns, and quality designations legible and intact. Do not open containers or remove markings until materials are inspected and accepted.

2. Store and protect accepted materials in accordance with manufacturer's directions and recommendations. Unless otherwise directed, store materials in original containers at not less than 70° F. for not less than 24 hours immediately before installation

09 65 00.03: EXECUTION

A. PREPARATION

1. Examine substrate for excessive moisture content and unevenness which would prevent execution and quality of resilient flooring as specified. Do not proceed with installation of resilient flooring until defects have been corrected except where correction is indicated in this Section.

2. Maintain temperature in space to receive tile between 70° F. and 90° F. for not less than 24 hours before and 48 hours after installation; maintain minimum temperature of 55° F. thereafter.

3. Remove dirt, oil, grease, or other foreign matter from surfaces to receive floor covering materials. Fill cracks less than 1/16-inch-wide and depression less than 1/8-inch-deep with crack filler. Prime surfaces other than wood if recommended by flooring manufacturer.

B. INSTALLATION

1. Lay flooring symmetrically about center line of rooms or spaces as indicated on the drawings with tile against all walls not less than 6 inches wide. Install only as much adhesive as can be covered in a single day; spread adhesive evenly in a fan-like pattern using the proper tools. Lay tiles straight and neat with tight straight joints; roll with heavy roller as installation progresses. Cut tile to fit accurately at joining with other materials. Install polished aluminum edging strips where the edge of tile is exposed and where tile abuts other floor finishes. Install strips to the floor with screws spaced 12 inches apart; anchor screws to concrete using plastic expansion shields. Pattern shall be straight; not alternating.

2. Install base around perimeter of room or space and at cabinet toe spaces where detailed on plans. Unroll base material and cut into accurate lengths as desired or as required for minimum number of joints. Match edges at all seams or double cut adjoining lengths. Install with tight butt joints with no joint widths greater than 1/64 inch.

3. Base corners will be manufactured type - field cut will not be acceptable.

4. Rubber treads and nosings will cover entire treads and nosing shall fit sloped face as detailed. Blisters, warps and irregularities will not be accepted.

C. FINISHING AND CLEANING

1. Upon completion of the installation of floor covering, adjacent work, and after materials have set, clean surfaces with a neutral cleaner as recommended by the manufacturer for the type of floor covering material installed.

2. After cleaning, the floor tile shall be properly protected until acceptance by a covering of heavy paper, and by board walks in all areas where damage to the floor may occur because of subsequent building operations.

D. MAINTENANCE MATERIALS

1. Furnish three (3) copies of manufacturer's maintenance methods and procedures. Provide instructional session with Owner's representatives.

2. Furnish additional floor covering materials for maintenance and replacement at the rate of one (1) carton for each 1500 sq. ft. Furnish materials of each size, color, pattern and type of material included in the work.

E. GUARANTEE

1. The Contractor shall replace all loose and broken tile, treads, nosings and/or rubber base, at no cost to the Owner, for a period of one year after completion and acceptance of the project.

DIVISION 09

SECTION 09 65 66: RESILIENT SPORTS FLOORING SYSTEM

09 65 66.01: GENERAL

A. SCOPE

1. Furnish all labor, materials, and equipment required to install the resilient multipurpose flooring system in strict accordance with manufacturer's standard installation procedures. The system consists of fully prepared substrate, 5mm OMNISPORTS™ flooring, manufacturer's recommended adhesive, and manufacturer's recommended application of the game lines (if used).

B. DESCRIPTION

1. The work of this section includes 5mm OMNISPORTS™ prefabricated sport surface with wood flooring design and slightly textured embossed surface including game lines (Basis of Design).

C. SUBMITTALS

1. Product Data: Submit manufacturer's product data and installation instruction. Include methods of installation and requirements for substrate preparation.

2. Manufacturer Certifications: Provide certification that accurately identifies the Original Equipment Manufacturer (OEM) of flooring furnished for this project including manufacturer's name, address and factory location. All "manufacturer" requirements in these specifications must be complied with by the OEM, including warranties, certifications, qualifications, product data, test results, environmental requirements, performance data, etc.

3. Samples: Submit representative samples of each material that is to be exposed in the completed work. Show full color ranges available and sample of welded seam.
   a. Submit for selection and approval three (3) sets of the indoor resilient multipurpose surfacing, manufacturer's brochures, samples or sample boards of all of the available colors, textures and styles.
   b. Submit color samples of all the available game line paint colors for selection and approval.

4. Shop drawings: Submit shop drawings for approval prior to fabrication. Include detailed plans, required clearances and accessories. Include relationship with adjacent materials.

5. Closeout submittals:
   a. Submit three (3) copies of the indoor resilient multipurpose surfacing and manufacturer's maintenance instructions.
   b. Submit three (3) copies of the material and installation warranties as specified.

D. QUALITY ASSURANCE

1. Qualifications:

   a. The indoor resilient multipurpose surfacing shall have been actively marketed for a minimum of ten (10) years.
   b. The indoor resilient multipurpose surfacing supplier shall be an established firm, experienced in the field, and appointed as a distributor by the manufacturer of the indoor resilient multipurpose surfacing.
   c. The installer shall have a minimum of five (5) years of experience in the field installing indoor resilient multipurpose surfacing and have worked on at least five (5) projects of similar size, type and complexity.

2. Certifications:

   a. Installer to submit the indoor resilient multipurpose surfacing manufacturer's certification attesting that the are an approved installer of the indoor resilient multipurpose surfacing.

3. Testing:

   a. Tests shall be relative for multi-purpose use with certificates from independent testing resources to be made available upon request. Test results shall be no more than 5 years old and performed according to ASTM standard testing procedures.

E. DELIVERY, STORAGE AND HANDLING

1. Delivery: Material shall not be delivered until all related work is in place and finished and/or proper storage facilities and conditions can be provided and guaranteed stable according to TarkettSports recommendations.

2. Storage: Store the material in a secure, clean and dry location. Maintain temperature between 55° and 85° Fahrenheit. Store the indoor resilient athletic surfacing rolls in an upright position on a smooth flat surface immediately upon delivery to jobsite. Rolls shipped in rigid protective cardboard containers can be laid horizontally prior to unpacking and installation.

F. WARRANTY

1. Manufacturer's standard warranty against material failures shall be fifteen (15) years from date of Substantial Completion. Failures include, but are not limited to, the following:

   a. Material manufacturing defects.
   b. Surface wear and deterioration to the point of wear-through per ASTM F410/ASTM F1303.
   c. Failure due to substrate moisture exposure exceeding 83% relative humidity when tested according to ASTM F2170.

2. Special Limited Warranty: Installer's standard warranty to repair or replace sports flooring that fails due to poor workmanship or faulty installation within two (2) years from date of Substantial Completion.

G. ADDITIONAL MATERIALS

1. Furnish to the owner additional materials containing a total of at least 1% of each different color or design of the indoor resilient multipurpose surfacing used on the project.

09 65 66.02: PRODUCTS

1. Flooring shall be equal to OMNISPORTS™ – 5mm by TarkettSports (Basis of Design).

2. Material: Prefabricated sport surface 5mm with wood flooring design and slightly textured embossed surface. Embossing of wood design and solid colors must be the same; varying embossing or surface textures will not be allowed. Printing of wood design shall closely resemble standard wood strip flooring in size, color, board length and grain appearance. The wood design shall be protected by a clear layer of pure PVC (Polyvinyl Chloride) and Top Clean, a factory applied UV cured urethane treatment. Intermediate layers shall be fortified with a non-woven fiberglass grid for increased dimensional stability. The foam force reduction layer shall be high-density closed cell PVC foam with honeycomb embossing, and is applied in one continuous manufacturing process. Laminated or adhered foam layers will not be allowed. Field constructed products will not be accepted.

3. Color: As available from the indoor resilient multipurpose surfacing manufacturer's standard range. Submit color samples for Architect approval.

4. Adhesive: Manufacturer's recommended adhesive for glue-down installation.

5. Game Line Paint Primer and Paint: As approved by the indoor resilient multipurpose surfacing manufacturer. Colors are to be selected from the manufacturer's standard range by the Architect.

6. Physical Properties:

a.	Tile Size:	6'-6" wide x 85' length (approx.)
b.	Wear Layer:	2 mm
c.	Total Thickness	5 mm
d.	Wear Layer:	Type 1, Grade 1; ASTM F1303/F410

7. Performance:

a.	Vertical Deformation:	Passed (ASTM F2772)
b.	Rolling Load:	Passed (0.30 (EN 1569 {11/1999}))
c.	Surface Finish Effect:	Passed (ASTM F2772 (80-110))
d.	Chemical Resistance:	OK (ASTM D543)
e.	Abrasion Resistance:	Passed (0.10 (EN ISO 5470-1 {06/1999})
f.	Static Load Limit:	Passed (ASTM F970- Load 200lbs)
g.	Sound Insulation:	Excellent (+/= 19 dB (ISO 717/2))
h.	Ball Rebound:	Passed (ASTM 140/8)
i.	Shock Absorption:	Passed (ASTM F2772 Class 2)

8. Safety:

a.	Fire Rating:	Passed (ASTM E648 Class 1)

b.	Microbial Assays Test:	No Growth (G21 ASTM - Backing)
c.	Phthalate Free Technology:	Yes
d.	REACH Compliant:	Yes
e.	Formaldehyde:	No
f.	Hazardous Material:	No

9. Welding Rod: As supplied by the indoor resilient multipurpose surfacing manufacturer. Color to blend with the indoor resilient multipurpose surfacing color or design. All seams shall be welded to create a monolithic and impermeable surface.

09 65 66.03: EXECUTION

A. EXAMINATION

1. It is the responsibility of the General Contractor to ensure that project/site conditions are acceptable for the installation of the indoor resilient multipurpose flooring.

2. Verify that the area in which the indoor resilient flooring will be installed is dry and weather tight. Verify that permanent heat, light and ventilation is installed and operable.

3. Verify that all other work that could cause damage, dirt and dust or interrupt the normal pace of the indoor resilient flooring installation is completed or suspended.

4. Verify that there is a stable room temperature of at least 65° Fahrenheit.

5. Verify that there are no foreign materials or objects on the subfloor and that the subfloor is clean and ready for installation.

6. Direct Full Spread Adhering to Concrete Subfloor: moisture content less than 83% RH when tested per ASTM F2170.

7. Do not average the test results of the tests. Report all field test results in writing to the General Contractor, Architect, and End User prior to installation.

8. Verify that the concrete subfloor surface pH level is within the 7-9 range.

9. Document the results indicating the slab is within manufacturer's tolerances for slab deviation.

B. SUBSTRATE PREPARATION

1. Sand the entire surface of the concrete slab.

2. Sweep the concrete slab so as to remove all dirt and dust. If a sweeping compound is to be used it must be a sweeping compound that does not contain oil or other items that may inhibit the adhesive bond.

3. Slab must be dust free. In the event that dust impairs adhesive bond, priming the slab prior to application of adhesive may be necessary. Follow installation guidelines.

C. INSTALLATION

1. The installation area shall be closed to all traffic and activity for a period to be set by the indoor resilient multipurpose flooring installer. The resilient flooring installation shall not begin until the installer is familiar with the existing conditions.

2. All necessary precautions should be taken to minimize noise, smell, dust, the use of hazardous materials and any other items that may inconvenience others.

3. Install the indoor resilient multipurpose flooring in strict accordance with the indoor manufacturer's written instructions.

4. Install the indoor resilient multipurpose flooring minimizing cross seams. Provide a seam diagram during the submittal process for approval prior to installation. Vinyl Sheet Flooring Seams: Comply with ASTM F1516. Rout joints and heat weld to permanently and seamlessly fuse sections together. Apply transitions at doorways as needed.

5. Paint game lines using approved game line paint primer and game line paint in strict accordance with the game line paint manufacturer's instructions.

6. Install appropriate threshold plates or transition strips where necessary.

7. Instruct Owner's personnel in proper maintenance procedures.

D. CLEAN-UP

1. Remove all unused materials, tools and equipment and dispose of any debris.

2. Clean exposed surfaces using non-abrasive materials and methods recommended by manufacturer.

3. Protect specialty flooring until acceptance of work by the Owner.

DIVISION 09

SECTION 09 66 23.16: EPOXY TERRAZZO 1/4" OR 3/8" nominal thickness

09 66 23.16.01: GENERAL

A. RELATED WORK SPECIFIED IN OTHER SECTIONS

1. Backing for Epoxy Terrazzo base must be cement board or exterior grade plywood, concrete block, concrete or cement plaster.

2. Concrete subfloor, Section 03 30 00 Concrete Work.

   NOTE: CONCRETE SUBFLOOR TO BE LEVEL (MAXIMUM VARIATION NOT TO EXCEED 1/4 INCH IN 10 FEET) AND TO HAVE A STEEL TROWEL FINISHED SURFACE. NO CURING AGENTS OR OTHER ADDITIVES WHICH COULD PREVENT BONDING SHOULD BE USED. THE SLAB SHOULD HAVE AN EFFICIENT MOISTURE BARRIER UNDER THE CONCRETE SLAB WHEN PLACED DIRECTLY ON GRADE. SAW CUTTING OF CONTROL JOINTS MUST BE DONE BETWEEN 12-24 HOURS AFTER PLACEMENT OF THE STRUCTURAL CONCRETE.

3. Broom clean area to receive terrazzo of loose chips, laitance and all foreign matter.

4. Sufficient water, temporary heat and light and adequate electric with suitable outlets connected and distributed for use within 100 feet of any working space.

   NOTE: AMBIENT TEMPERATURE SHALL BE MAINTAINED AS PER MANUFACTURERS RECOMMENDATIONS, MINIMUM 50° FAHRENHEIT.

B. QUALITY ASSURANCE

1. Acceptable supplier:

   a. Materials furnished shall meet NTMA Specifications.

2. Installer qualifications:

   a. Installer shall be a contractor member of NTMA and shall perform all work in accordance with NTMA standards.
   b. If installer is not a contractor member of NTMA, they shall submit a list of completed projects of a similar magnitude and complexity.

C. SUBMITTAL

1. Samples:

   a. Submit a maximum of three samples, minimum 6" x 6" for each color and type of terrazzo.
   b. Submit two, 6" minimum lengths of each type and kind of divider strips.

2. Maintenance Literature:

   a. Submit two copies of maintenance recommendations of NTMA or maintenance product members of NTMA.

3. Certification:

   a. Suppliers shall furnish certification attesting that materials meet specification requirements.
   b. Suppliers shall furnish properly labeled material and Material Safety Data Sheets which comply with current state and federal requirements.

D. DELIVERY, STORAGE AND HANDLING

1. Delivery of materials:

   a. Deliver materials in a manner to prevent damage to containers and/or bags.

2. Storage of materials:

   a. Store materials in a clean, dry and heated (if necessary) location (50-90 degrees Fahrenheit) furnished by others.

E. GUARANTEE

1. One year from date of substantial completion of Terrazzo installation.

09 66 23.16.02: PRODUCTS

A. MATERIALS

1. Primer: As recommended by Epoxy Resin Supplier.

2. Epoxy resin mixed according to manufacturer's recommendation and tested without aggregate added. All specimens cured for 7 days at 75 degrees plus or minus 2 degrees Fahrenheit and 50% plus or minus 2 R.H. The product shall meet the following requirements:

PROPERTY	TEST METHOD	REQUIREMENT
HARDNESS	ASTM D-2240 using Shore D Durometer	60 -85
TENSILE STRENGTH	ASTM D-638 turn at .2" min. Specimen made using "C" die listed in ASTM D-412	3,000 psi min.
COMPRESSIVE STRENGTH	ASTM D-695, Specimen B cylinder	10,000 psi min
CHEMICAL RESISTANCE	ASTM D-1308 -7 days at room temperature, by immersion method, have no deleterious effects.	

The following contaminants used:

Distilled Water ……	I% Soap Solution
Mineral Water ……	10% Sodium Hydroxide
Isopropanol ……	10% Hydrochloric Acid
Ethanol ……	30% Sulfuric Acid
.025 Detergent Solution……	5% Acetic Acid

3. Epoxy Resin mixed according to manufacturers recommendations and blended with 3 volumes of Georgia White marble blended 60%#1 chip and 40% #0 chip, ground and grouted with epoxy resin according to 3.02 C-2-Finishing to a nominal 1/4" thickness. All specimens cured 7 days at 75 degrees plus or minus 2 degrees Fahrenheit and 50% plus or minus 2% R.H. The finished epoxy terrazzo shall meet the following requirements:

   a. Flammability: When tested in accordance with ASTM-D-635, the Epoxy terrazzo shall comply with the following value: Self-extinguishing, extent of burning 0.25 inches maximum.
   b. Thermal Coefficient of Linear Expansion: when tested in accordance with ASTM-D-696, the Epoxy terrazzo will comply with the following value: 25 x 10-6 inches per inch per degrees to 140 degrees Fahrenheit maximum. Temperature range -12 degrees to 140 degrees Fahrenheit.
   c. Bond Strength: When tested in accordance with Field Test Method for surface soundness and adhesion as described in ACI Committee No. 403 Bulletin Title No. 59-43 (Pages 1139-1141) the Epoxy terrazzo shall comply with the following value: 100% concrete failure minimum, with 300 PSI minimum tensile strength.

      NOTE: THIS TEST IS INTENDED TO EVALUATE THE BOND TO THE CONCRETE SUBFLOOR. A 100% CONCRETE FAILURE INDICATES A GOOD BOND.

4. Marble Chips:

   a. Size: To conform to NTMA gradation standards.
      NOTE: SEE PRODUCT INFORMATION.
   b. Abrasion and Impact resistance when testing in accordance with ASTM C 131-89 shall not exceed 40% loss.
   c. 24 Hour absorption rate not to exceed 0.75 percent.
   d. Chips shall contain no deleterious or foreign matter.
   e. Dust content less than 1% by weight.

5. Strips:

   a. Stop and divider "L" strips 14 gauge.

6. Terrazzo Cleaner:

   a. Ph factor between 7 and 10, where applicable.
   b. Biodegradable and phosphate free.

7. Sealer:

   a. Ph factor between 7 and 10, where applicable.
   b. Shall not discolor or amber.

c. Flash point: ASTM D-56, 80 degrees Fahrenheit minimum, where applicable.
d. U/L listed as "Slip Resistant."

B. MISCELLANEOUS ACCESSORIES

1. Moisture Mitigation: Two-component, high solids, moisture tolerant, high density, low odor, epoxy-based product produced by epoxy terrazzo resin manufacturer specifically recommended to reduce alkalinity levels and moisture emission to acceptable levels. If needed, Terrazzo Subcontractor shall provide at no additional cost to the Owner.

2. Crack Suppression/Isolation Membrane: As recommended, produced and supplied by approved terrazzo resin formulator, having minimum 120 percent elongation potential per ASTM D 412.

C. MIXES

1. Terrazzo Selection:

a. Type to be selected at a later date.

2. Proportions:

a. Epoxy Terrazzo Topping: In accordance with resin supplier's recommendations.

3. Mixing:

a. Terrazzo Topping: Charge and mix marble chips, filler and epoxy resin in accordance with manufacturer's recommendations.

09 66 23.16.03: EXECUTION

A. INSPECTION

1. Examine areas to receive terrazzo for defects in existing work that affect proper execution of Epoxy Terrazzo.

a. Defects in existing work that affect proper execution of terrazzo.
b. The subfloor shall not vary more than ¼" from true plane in 10'-0". Deviations beyond allowable tolerance for the concrete slab work shall not be acceptable. Also, moisture levels in the substrate shall be within the recommended levels prior to installation of terrazzo. If, for any reason, the subfloor is in question, the terrazzo subcontractor will be responsible for accepting the suitability of the substrate. If the substrate is not acceptable any work required to eliminate non-conformity of subsurface specifications is the responsibility of the General Contractor. Any materials used to correct non-conformity must be compatible with the epoxy system selected and must be approved by the terrazzo contractor.

2. Start work only when all defects have been corrected.

B. INSTALLATION

1. Subfloor:

   a. Prepare substrate to receive epoxy terrazzo in accordance with manufacturer's recommendations.
   b. Install control joints directly above control joints in subfloor.
   c. Install divider strips as shown on drawings.

2. Placing Terrazzo:

   a. Prime subfloor in accordance with manufacturer's recommendations.
   b. Place terrazzo mixture in panels formed by divider strips. Trowel mixture to top of strips.

3. Finishing:

   a. Rough Grinding:

      1) Grind with 24 or finer grit stones or with comparable diamond plates.
      2) Follow initial grind with 80 or finer grit stones.

   b. Grouting:

      1) Cleanse terrazzo with clean water and rinse.
      2) Remove excess rinse water and hand apply grout using identical color as used in topping, taking care to fill voids.

   c. Cure Grout.
   d. Fine Grinding

      1) Grind with 80 or finer grit stones until all grout is removed from surface.
      2) Upon completion, terrazzo shall show a minimum of 70% of marble chips.

4. Cleaning and Sealing:

   a. Wash all surfaces with a neutral cleaner.
   b. Rinse with clean water and allow surface to dry.
   c. Apply sealer in accordance with manufacturer's directions.

5. Protection:

   a. Upon completion, the work shall be ready for final inspection and acceptance by the Owner or his agent.
   b. The General Contractor shall protect the finished work from the time that the terrazzo contractor completes the work.

DIVISION 09

SECTION 09 68 13: CARPET AND SELF-ADHERING CARPET TILES

09 68 13.01: GENERAL

A. SCOPE

1. Furnish and install carpet as shown on the Room Finish Schedule and specified herein.

2. Submit samples for approval from the Architect.

3. The Carpet Manufacturer shall conduct a carpet maintenance meeting with the Owner's personnel, and shall provide a written maintenance program specifically for the installed carpet.

09 68 13.02: PRODUCTS

A. MATERIALS

1. The carpet shall be level loop, tufted continuous filament, stain resistant Nylon with static control for direct application to concrete slab and shall conform to the following requirements:

Face Construction	Imperial	Metric	
Construction	Level Loop		
Face weight	18 oz/sq yd	610.2	g/sq m
Gauge	1/13	50.4	rows/10 cm
Stitches per Inch	8.2	32.3	pu/10 cm
Pile Height Average	0.117 inch	3.0	mm
Fiber System	TDX Nylon		
Dye Method	50% Solution Dyed / 50% Yarn Dyed		
Soil/Stain Protection	Ensure	9.4	Kilotex
Primary Tufting Substrate	Synthetic Non-Woven		
Pattern Repeat	N/A		

Product Testing/Information	
Antimicrobial Chemicals	No antimicrobials (EPA Registered pesticides) added to product (ASTM E2471-05)
Electrostatic Propensity	2.2kV (AATCC 134); Permanent Conductive Fiber
Surface Flammability	Passes CPSC FF 1-70 (ASTM D-2859)
Flooring Radiant Panel	Class 1 (mean average CRF: 0.45 w/sq cm or higher) (ASTM E-648)
Smoke Generation	Less than 450 (ASTM E-662)

B. DELIVERY AND STORAGE

1. All carpet shall be delivered to the job site in original mill wrappings with each roll having its register number properly attached.

2. Material shall be stored in an enclosed and dry area protected from damage and soiling.

09 68 13.03: EXECUTION

1. The Carpet Contractor's work includes unloading and transporting the carpet to the appropriate locations at the job site.

2. The Carpet Contractor will be totally responsible for the accuracy of his measurements on total square yardage requirements.

3. The Carpet Contractor shall coordinate all his activities with those of the General Contractor.

4. Carpet shall be installed using adhesives and installation techniques as recommended by carpet manufacturers. Seams are to be welded.

5. All surfaces to receive carpet shall be thoroughly clean, dry, dust free and in a condition satisfactory for the installation of the carpet. The Carpet Contractor shall notify the General Contractor of any conditions which will prevent him from producing satisfactory finish work. The start of carpet installation shall be an indication of his acceptance of the surfaces as being satisfactory for installing carpeting and he will automatically assume the responsibility for any unacceptable finish work caused by floor conditions.

09 68 13.04: GUARANTEES

1. The Carpet Contractor shall furnish a written (1) one-year guarantee as of the date of acceptance of the installation by the Owner's representative, covering repairs or replacement due to defects in installation workmanship.

2. The Carpet Manufacturer shall furnish a written (15) fifteen-year guarantee from the date of installation against excessive wear, delamination, edge raveling and failure of the adhesive system. Manufacturer must also provide a written lifetime guarantee from the date of installation against failure of backing resiliency.

09 68 13.05: MANUFACTURERS

1. Tandus Floor
2. The Mohawk Group
3. Shaw
4. Patcraft

DIVISION 09

SECTION 09 84 00: ACOUSTICAL WALL TREATMENT & ACOUSTICAL CEILING BAFFLES

09 84 00.01: GENERAL

A. SUMMARY

1. Section Includes: Cementitious wood fiber plank acoustical wall panel system, sound absorbing ceiling baffles and installation accessories.

2. Related Sections:

   a. Division 09 Sections: Acoustical Suspension.
   b. Division 09 Sections: Acoustical Ceilings.

B. REFERENCES

1. American Society for Testing and Materials (ASTM):

   a. ASTM C635 Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
   b. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
   c. ASTM E1264 Standard Classification for Acoustical Ceiling Products.

2. Ceilings and Interior Systems Construction Association (CISCA).

   a. CISCA Code of Practices.

C. SYSTEM DESCRIPTION

1. Performance Requirements:

   a. Provide acoustical wall panel assembly designed and tested to provide surface burning characteristics (ASTM E84) as follows:

      1) Flamespread: NCBC 2002
      2) Smoke Developed: NCBC 2002

   b. Provide acoustical wall panel system which has been manufactured, fabricated and installed to provide Noise Reduction Coefficient (NRC) rating as follows:

      1) Required NRC rating 1.00.

D. SUBMITTALS

1. General: Submit listed submittals in accordance with Conditions of the Contract and Division 01 Submittal Procedures Section.

2. Product Data: Submit manufacturer's product data and installation instructions.

a. Recommended procedures for normal cleaning and removal of stains including precautions in use of cleaning materials that may be detrimental to surfaces.

3. Samples: Submit selection and verification samples: 6" x 6" sample for each wood fiber wall panel unit required, showing full range of exposed texture to be expected in completed work and One 8" x 10" sample for each fabric color is available if applicable.

4. Quality Assurance/Control Submittals: Submit the following:

a. Test Reports: Upon request, submit certified test reports from recognized test laboratories.
b. Certificates: Submit manufacturer's certificate that products meet or exceed specified requirements.

E. QUALITY ASSURANCE

1. Installer Qualifications: Utilize an installer having demonstrated experience on projects of similar size and complexity.

2. Regulatory Requirements and Approvals: Comply with requirements below.

a. New York City Board of Standards and Appeals:

1) Calendar No. L391-52-SM.

b. Corps of Engineers Guide Specification:

1) CE-219.01.

c. Southern Building Code Congress International (SBCCI)

1) SBCCI Report 9406A.

d. International Conference of Building Officials (ICBO)

1) ICBO Research Report No. 1116.

e. Building Officials and Code Administrators International, Inc. (BOCA)

1) BOCA Research Report No. 86-39.

F. DELIVERY, STORAGE & HANDLING

1. General: Comply with Division 01 Product Requirement Section.

2. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

a. Prevent soiling, physical damage or wetting.
b. Store cartons open at each end to stabilize moisture content and temperature.

G. PROJECT/SITE CONDITIONS

1. Environmental Requirements:

   a. Do not install acoustical panels until building is closed in and HVAC system is operational.
   b. Locate materials onsite at least 24 hours before beginning installation to allow materials to reach temperature and moisture content equilibrium.
   c. Maintain the following conditions in areas where acoustical materials are to be installed 24 hours before, during and after installation:

      1) Relative Humidity: 65-75%.
      2) Uniform Temperature: 55-70 degrees F.

H. MAINTENANCE

1. Extra Materials: Provide two wall panels (properly packaged) for use by owner in building maintenance and repair.

09 84 00.02: PRODUCTS

A. ACOUSTICAL WALL PANEL SYSTEM (Basis of Design)

1. Manufacturer: Tectum Inc., a subsidiary of Armstrong World Industries, Inc.

   a. Contact: 105 South 6th St., Newark, OH 43055; Telephone: (888) 977-9691, (740) 345-9691; Fax: (800) 832-8869; E-mail: info@tectum.com; website: www.tectum.com .

2. Proprietary Systems. Acoustical wall panel and Baffle Systems, including the following:

   a. Tectum Standard Interior Wall Panels:

      1) Material: Aspen wood fibers bonded with inorganic hydraulic cement.
      2) Thickness: 1″
      3) Edge: Beveled.
      4) Size: 4′ x 4′ unless otherwise noted on the drawings.
      5) Color: Factory painted white. Finish: Paint to match wall color.
      6) Mounting Style: 1 x 4 Wood Furring Strips.

3. Accessories:

   a. Painted Head Drywall Screws:

      1) Material: Steel.
      2) Length: 1 5/8″.
      3) Color: White.

   b. Painted Head CMU Screws:

      1) Length: 2 1/4″
      2) Color: White.

B. SOUND ABSORBING ACOUSTICAL CEILING BAFFLES (Basis of Design)

1. Manufacturer: MBI Products Company, Inc.

   a. Contact: 801 Bond St., Elyria, OH 44035; Telephone: (440) 322-6500; Website: www.mbiproducts.com .

2. Proprietary Systems. Acoustical ceiling baffle systems, including the following:

   a. Cloud-Lite® Acoustical Baffles

      1) Material: PVC 2", 3#
      2) Heat sealed, PVC film
      3) Grommet/Flap
      4) Color: To be determined by the Architect.

C. PRODUCT SUBSTITUTIONS

1. Substitutions: Substitutions permitted.

09 84 00.03: EXECUTION

A. MANUFACTURER'S INSTRUCTIONS

1. Comply with the instructions and recommendations of the acoustical wall panel system manufacturer and acoustical ceiling baffle manufacturer.

2. Install materials in accordance with governing regulations, fire resistance rating requirements and industry standards applicable to work.

   a. Comply with CISCA Code of Practices.

B. EXAMINATION

1. Site Verification of Conditions:

   a. Examine surfaces scheduled to receive suspended or directly attached acoustical units for unevenness, irregularities and dampness that would affect quality and execution of work.
   b. Do not proceed with installation of wall panel system until unacceptable conditions are corrected.

C. INSTALLATION

1. Screw head to be flush with wall panel surface.

2. Securely affix wall panels by means of splines attached vertically to 1 x 4 furring strips. Engage vertical kerfs on the edges of the wall panels with splines. Apply adhesive and screws to attach panels to furring strips.

   a. No field cut panels.

D. CLEANING

1. Clean exposed surfaces of acoustical panel, trip, moldings and suspension members to comply with manufacturer's instructions for cleaning.

2. Touch up any minor finish damage.

3. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

E. PROTECTION

1. Protect installed work from damage due to subsequent construction activity, including temperature and humidity limitations and dust control, so that the work will be without damage and deterioration at the time of acceptance by the Owner.

DIVISION 09

SECTION 09 90 00: PAINTING

09 90 00.01: GENERAL

A. SCOPE

1. The following specifications cover the complete painting and finishing of all surfaces, interior and exterior, except as otherwise specified. The painting contractor shall, as part of this contract, furnish all materials, labor, tools, scaffolds, and other appliances required to properly execute and complete the work according to the plans and specifications.

2. The painting contractor shall examine the specifications for the various other trades and shall thoroughly familiarize himself with all their provisions regarding their painting. All surfaces that are left unfinished by the requirements of other specifications shall be painted or finished as a part of this contract. Copper, chromium plate, stainless steel, aluminum and Monel metal shall not be painted or finished, unless otherwise specified. If the surface to be finished cannot be put in proper condition for finishing by customary preparation methods, the painting contractor shall notify the general contractor or Architect in writing or thereby assume responsibility for and correct any unsatisfactory finish resulting.

B. WORK INCLUDED

1. Exterior painting shall include, but not be limited to:

   a. All metal doors (including overhead doors) and frames.
   b. All exposed structural steel, steel joist, metal deck and other ferrous metal work.
   c. Exposed louvers and grilles.
   d. Gypsum board soffits.
   e. All gutters, downspouts, fascia, metal panels, copings, gravel stops, etc... unless prefinished.
   f. Steel stairs and handrails.
   g. Concrete columns or exposed deck.
   h. All metal louvers except factory finished.

2. Interior painting shall include, but not be limited to:

   a. All exposed concrete block walls and partitions.
   b. All gypsum wallboard walls and exposed ceilings.
   c. All metal doors (including overhead doors) and frames.
   d. All wood doors and trim which are not prefinished.
   e. All exposed structural steel, steel joist, metal deck and other ferrous metal work.
   f. All exposed Mechanical ductwork, piping and conduit.
   g. Wood shelving and cabinets which are not prefinished.
   h. All other exposed woodwork not specifically mentioned.
   i. Steel handrails.
   j. Concrete columns.
   k. All exposed roof or floor deck, etc.
   l. All exposed conduit, raceway, etc.

C. SUBMITTALS

1. Submit brand name and manufacturer of all products proposed for use. Obtain Architect's approval of all products prior to placing orders.

09 90 00.02: PRODUCTS

A. MANUFACTURER

1. All paint and related material applied in the field shall be the products of PPG Industries, Inc., Sherwin Williams, Benjamin Moore or Pratt & Lambert.

2. Colors shall be selected by the Architect and approved by the owner. Final finishes will match the selected samples.

B. MATERIALS

1. Ready mixed paint or paints colored by the manufacturer's authorized agents prior to delivery to the job site shall be used for all painting. Enamels and exterior paints shall be non-yellowing, and exterior paints shall be non-chalking.

2. All shellac shall be white, composed of pure gum. Only when absolutely necessary shall shellac be thinned and then only with pure denatured alcohol.

3. All paint for exterior work shall either contain a mildewcide in the paint formula or shall have an approved mildewcide additive mixed into the paint at the jobsite in strict accordance with the paint manufacturer's recommendations.

4. Putty shall be commercial grade of putty composed of linseed oil, and whiting.

5. Wood fillers shall be select paste fillers to match color of the stain to be used, not tinted with stain on the job.

6. Stains shall be as manufactured or furnished by manufacturer of finishing materials. Stains shall be compatible with surface receiving it, and with other finishing materials being applied.

7. Turpentine shall be pure gum spirits of turpentine, conforming to ASTM Specification A13-51.

8. Mineral spirits shall conform to ASTM Specification D13-51.

C. DELIVERY AND STORAGE

1. A room on the premises shall be assigned to the painting contractor for the storage of his tools and materials. The floor shall be properly protected with drop cloths or building paper. Paint shall be mixed in suitable containers and necessary precautions shall be taken to prevent fire. All oily rags and waste must be removed from the building every night and proper precautions taken to avoid the danger of fire.

2. All materials used on the work shall be the brand and quality specified and shall be delivered in the original containers with the seals unbroken and labels intact. No

claim by the painting contractor as to the unsuitability or unavailability of any material specified, or his unwillingness to use same or his inability to produce first class with same, will be entertained unless such claims are made in writing and submitted with his bid. All materials shall be used only as specified by the manufacturer's direction label on the container. If required, panels for finish and color shall be prepared in advance with the specified materials, and for the approval of the Architect.

09 90 00.03: EXECUTION

A. SCHEDULE OF PAINTING

1. PPG Paint materials and numbers used as basis of design to indicate quality. Paint other than that specified by the Architect may be used only after written permission of the Architect is obtained.

2. A color schedule prepared by the Architect and representative of the paint manufacturer will be issued to the general contractor designating colors, finishes, etc., for all painted surfaces and areas. Any painted surface that is not in accordance with the color schedule shall be repainted.

3. Finishes: See room finish schedule for painted areas and paint colors. The painting contractor is to note that these specifications specify quality and type of paint; whereas, the paint numbers on the finish schedule identify color and not necessarily quality or type. These are typical specifications for the painting of various surfaces. The absence of a formal color schedule will not relieve the contractor from any responsibility to paint all surfaces and materials listed herein. This job may not require or include all the types of paint specified, nor is it limited to the following types:

   a. Exterior

      1) Metals:

         a) Non-Ferrous: Receives no paint
         b) Ferrous:

            i) Galvanized:

               1 coat: PPG 90-712 Pitt Tech DTM Acrylic Metal Primer Finish.
               2 coats: PPG Paints 7-282 Seven Line Industrial Gloss Alkyd Enamel.

      2) Stucco:

         1 coat: PPG 4-603 Perma Crete Acrylic Alkali Resistant Primer.
         2 coats: PPG 6-610XI Speedhide Exterior 100% Acrylic Eggshell Finish.

      3) Brick: (When noted on drawings as receiving paint)

         1 coat: PPG 4-603 Perma Crete Acrylic Alkali Resistant Primer.
         2 coats: PPG 6-610XI Speedhide Exterior 100% Acrylic Eggshell Finish.

4) Block: (When noted on drawings as receiving paint)

1 coat: PPG 6-7 Speedhide Int./Ext. Latex Masonry Block Filler.
2 coats: PPG 6-610XI Speedhide Exterior 100% Acrylic Semi-Gloss Finish.

5) Woodwork:

1 coat: PPG 6-609 Speedhide Exterior Latex Wood Primer
2 coats: PPG 6-610XI Speedhide Exterior 100% Acrylic Semi-Gloss Finish.

6) Concrete: When paint is specified, apply proper primer and 2 coats of Sonneborn Desoto Super Colorcoat VOC. Applied in strict accordance with the label instructions.

7) Gypsum Board Soffits:

2 coats: PPG 6-610XI Speedhide Exterior 100% Acrylic Eggshell Finish.

b. <u>Interior:</u>

1) Metals:

a) Non-Ferrous: Receives no paint
b) Ferrous, Steel, Ornamental Iron and Steel:

1 coat: PPG 6-208 Speedhide Alkyd Rust Inhibitive Steel Primer.
2 coats: PPG 6-1110XI Speedhide Alkyd Semi-Gloss Enamel.

2) Plaster:

a) Vinyl Finish:

1 coat: PPG 17-921 Seal Grip 100% Acrylic Universal Primer.
2 coats: PPG 6-70 Speedhide Interior Latex Wall Paint.

b) Eggshell Alkyd Oil Finish:

1 coat: 100% Acrylic Universal Primer/Sealer
2 coats: Interior Eggshell Alkyd Oil Enamel.

3) Concrete Block:

1 coat: Interior/Exterior Masonry Latex Block Filler.
2 coats: Interior Waterborne Acrylic Semi-Gloss Enamel.

4) Concrete Block and Concrete Columns - Epoxy Finish:

1 coat: Interior/Exterior Masonry Latex Block Filler.
*Note: In moisture prone areas fill with Cementitious Waterproofing Block Filler.
2 coats: High Build Semi-Gloss Polyamide Epoxy Coating.

5) Gypsum Board Walls & Ceilings:

1 coat: Interior Acrylic Latex Primer Sealer.
2 coats: Interior Acrylic Latex Eggshell Wall Paint.

6) Wood (Stained) Cabinets and Doors:

1coat: Interior Oil Based Wood Stain.
1coat: Interior Gloss Polyurethane Varnish, thinned to a 9:1 ratio with mineral spirits
2 coats: Interior Gloss Polyurethane Varnish

7) Wood (Painted):

1 coat: Interior Alkyd Enamel Undercoater.
2 coats: Interior Alkyd Oil Semi-Gloss Enamel.

c. Asphalt and Concrete Paving: Parking lines, etc., as shown on the site plan to be painted using equal grade and type white paint used by the State Highway Department for the road lane markings. Submit verification of quality for Architects approval.

d. Interior-Trim-Specifications: Alkyd Semi-Gloss Enamel.

e. Wood (Doors, Door Trim, Window Trim, Baseboards):

1) First Coat: Interior Alkyd Enamel Undercoater.
2) Second Coat: Interior Alkyd Oil Semi-Gloss Enamel

f. Metal (Doors, Door Trim, Window Trim, Baseboards):

1) Unprimed Ferrous Metals:

a) First Coat: PPG 6-208 Speedhide Int./Ext Rust Inhibitive Steel Primer.
b) Second Coat: Interior Alkyd Oil Semi-Gloss Enamel.
c) Third Coat: Interior Alkyd Oil Semi-Gloss Enamel

2) Primed Ferrous Metals:

*Note: Spot damaged areas with recommended primer.

a) First Coat: Interior Alkyd Oil Semi-Gloss Enamel.
b) Second Coat: Interior Alkyd Oil Semi-Gloss Enamel.

B. PREPARATION OF SURFACES

1. All work shall be done in a workmanlike manner by skilled mechanics. All material shall be evenly spread and smoothly flowed on without sags or runs, and all coats shall be thoroughly dry before applying the succeeding coats. Enamel or varnish finish applied to wood or metal shall be sanded between coats with fine sandpaper to produce an even smooth finish. No exterior painting shall be done in rainy, damp, or frosty weather, or until the surface is thoroughly dry. No interior painting or finishing shall be permitted until the building has thoroughly dried out by natural or artificial heat.

2. All exterior and interior trim shall be back-primed before installation. Tops of all upper sashes and bottoms of all lower sashes shall be finished the same as balance of the exterior sash and tops, bottoms and edges of doors shall be finished the same as the balance of the doors after they are fitted and/or installed by the carpenter. All closets and the interior of all cabinets shall be finished the same as noted.

3. All surfaces to be painted shall be free of loose dirt, dust and grease. Knots, sap streaks and pitch areas shall be scraped or burned, then coated with shellac before

priming coat is applied. Mildew shall be removed by washing thoroughly with a solution of tri-sodium phosphate (six ounces to a gallon of water). The surface shall be rinsed well with water.

4. All necessary puttying of nail holes, cracks, etc., shall be done after the first coat is dry. On metal surfaces, weld-spatter, burrs on cut edges, and sharp points various kinds shall be removed. New or unfinished wood shall be sanded as required. Cracks and countersunk nail holes shall be puttied with white putty after priming coat is dry. Paste wood filler, applied on open grain wood, when "set" shall be wiped across the grain of the wood, then with the grain to secure a clean surface.

5. Iron and steel arriving on the job with a shop prime coat applied shall be carefully sanded and all bare spots re-primed. Where rust or scale is present, it shall be wire brushed, or sand papered clean before painting. Shop coats of paint that become marred shall be cleaned and touched up with a similar primer. All field welds and bolts shall be spot primed.

6. All copper surfaces shall be wiped with one of the acceptable solvents to remove oil and grease. It shall be sanded lightly to remove deposits of verdigris (green corrosion products).

7. All galvanized metal surfaces shall be wiped with one of the acceptable solvents to remove oil and grease. The white deposit on weathered galvanized metal shall be removed with soap and water and rinsed well with fresh water and chemically treated with a compound designed for this purpose in accordance with manufacturer's directions for use before applying the first coat of paint.

8. All masonry materials shall be allowed to dry completely (usually 30 to 60 days) before painting. If painting when "green" or damp, the active alkali in these surfaces may "burn" the vehicle and color of succeeding coats of conventional paint. Cracks and crevices of interior plaster and masonry shall be filled with surface filler and sanded smooth, for exterior masonry surfaces, a Portland cement-lime mortar shall be used. Glaze from a hard-troweled surface shall be removed by etching with muriatic acid (5%-1% solution with water). After etching, the surface shall be flushed with water and allowed to dry. All cracks, gouges, nail holes and other imperfections on composition boards shall be filled with synkoloid spackling paste. Patched areas and points shall be sanded.

9. Any existing wall surfaces, doors, trim, etc... which are damaged in the construction process, shall be repainted.

C. APPLICATION

1. Perform painting only under approved conditions of adequate ventilation. Provide adequate protection against toxic fumes, and adequate safeguards against fire and explosion.

2. The commencing of work, or the absence of notification in writing to the contrary, shall be construed as acceptance by the Painting Subcontractor of the surfaces to be finished as satisfactory to receive the finishes, and to produce the results required.

3. All paint work, unless otherwise called for, shall be brush work and shall be first class in every respect, free from brush marks, runs and sags.

4. All millwork items shall be back-primed under this section before installation of items. Items specified to be finished natural or stained shall be back-primed with white shellac, and all other items shall be back-primed with enamel undercoat.

5. The priming coat on all surfaces shall be tinted to the approximate shade of the final coat and touched up before applying the second and third coats to produce an even finish. The Contractor will secure color schedules before priming. All coats shall be thoroughly dry before applying succeeding coats.

6. Pastewood filler, applied on open grain wood, when "set" shall be wiped across the grain to secure a clean finish. All wood work to be finished with enamel shall be sanded smooth and the surface cleaned before proceeding with the application of the first coat. Enamel applied to wood shall be sanded between coats with fine sandpaper to produce an even, smooth finish. All interior wood trim shall be back-primed before installation.

7. The tops, bottoms and edges of all doors, to be painted or stained, shall be finished to match the surface of the doors after the hardware has been attached. Any door found unpainted upon the completion of the painting work will be taken down and painted.

8. All closets and the interior of all cabinets are to be finished the same as adjoining rooms, unless otherwise specified or directed. All other surfaces shall be finished the same as nearest or adjoining surfaces unless otherwise shown on the drawings.

9. No material will be applied over a damp surface. Exterior work shall not be performed during dusty, rainy, or frosty weather. A temperature of 70 degrees F. or more shall be maintained when enamel is being applied and 50 degrees F. or more during other interior painting. Exterior painting will be performed when the air temperature is 50 degrees F. or higher in drying weather.

10. Access doors or panels, electric panelboard covers, pipes, ducts and raceways shall be painted the same color as adjacent surfaces. All piping exposed in finishing areas shall be painted as required for interior ferrous metal. Where galvanized pipe occurs, paint galvanized surface as specified.

11. Hardware and accessories, fixtures, and similar items placed prior to painting shall be removed or protected during painting and replaced on completion of painting.

12. All work shall be complete. When color, stain, dirt, or undercoats show through the final coat of paint, the work shall be covered by additional coats until the paint is of uniform color and appearance and coverage is complete to the satisfaction of the Owner's representative.

D. PROTECTION AND CLEAN-UP

1. The Contractor shall not only protect the painting work at all times, but shall also protect all adjacent work and materials by suitable coverings or other methods during progress of the work. Upon completion of the painting all paint spots shall

be removed. All rubbish and accumulated materials of any nature shall be removed from the job site leaving the work in a clean, orderly and acceptable condition.

2. Extras: No payment in addition to the amount agreed upon in his contract shall be paid to the painting contractor unless authorized in writing by the Architect.

DIVISION 10

SECTION 10 11 16.23: MARKERBOARDS AND TACKBOARDS

10 11 16.23.01: GENERAL

A. SCOPE

1. Furnish and install all markerboards, tackboards and accessories, complete as indicated on the drawings and specified herein.

B. WORK INCLUDED

1. Work under this section includes all markerboards/tackboards mounted on walls.

C. SUBMITTALS

1. Submit shop drawings showing complete fabrication and installation details in accordance with requirements of SHOP DRAWINGS Section of DIVISION 01.

10 11 16.23.02: PRODUCTS

A. MARKERBOARDS

1. Markerboards shall be equal to AARCO Products, Platinum Visual System, or Claridge Products (face sheet minimum 26 ga. with hardboard stabilizer and aluminum foil backing) 4'-0" high; trim shall be clear anodized aluminum with 1" map/tack rail. Colors shall be selected by the Architect. Provide 2 Flag Holders and 8 Map/Paper Clips per room with Markerboard. Grades K-6: Set bottom of board 24-32 inches from floor. Grades 7 & above: Set bottom of board 30-36 inches from floor. Verify installation height with Architect before beginning work.

B. TACKBOARDS

1. Tackboards shall be equal to AARCO Products, Platinum Visual System, or Claridge Products, 4'-0" high with aluminum slip-on trim with 1" map rail and fiberboard backing. Colors shall be selected by the Architect. Set bottom of board as indicated on the drawings. Provide special sizes as indicated on the drawings.

10 11 16.23.03: EXECUTION

A. INSTALLATION

1. All work in this division shall be done by skilled mechanics in strict accordance with approved shop drawings and manufacturer's instructions. After installation, markerboard and tackboard surfaces shall be thoroughly cleaned and left in perfect condition.

DIVISION 10

SECTION 10 14 00: IDENTIFYING DEVICES

10 14 00.01: GENERAL

A. SCOPE

1. Furnish all labor, materials and equipment necessary to fabricate and install all items of the identifying devices as indicated on the drawings and specified herein.

B. SUBMITTALS

1. Shop drawings shall be submitted to and approved by the Architect before fabrication of any items to be furnished by the General Contractor.

10 14 00.02: PRODUCTS

A. MATERIALS

1. Room number/title signs shall be laminated plastic with engraved copy equal to Best System HC-300. Unless otherwise noted, letters and numbers shall be upper and lower case Helvetica. Colors will be selected by the Architect. Typical room signage for school projects are as follows:
   a. Sign Type A: 6" 6" x 6", Room Number, Name, Braille & (1) Window for Changeable Paper Insert. Utilize for all Offices, Classrooms, Music, Computer, Art & Resource Rooms.
   b. Sign Type B: 8" x 6", Room Name, Braille & Pictograms. Utilize at all restrooms.
   c. Sign Type C: 6" x 6", Room Number, Name & Braille. Utilize at all other rooms.
   d. Sign Type C Exterior: 6" x 6", Room Number, Name & Braille. Utilize at exterior doors entering Utility Rooms, Mechanical/Electrical, & Generator Panel Room.
   e. Sign Type D: 4" x 6", EXIT & Braille. Utilize at all egress doors to the exterior.

2. Building Title: Unless otherwise noted, letters shall be cast aluminum with baked enamel finish. Letter style shall be Times Roman, unless otherwise noted. Any questions about style will be verified with the Architect. Color to be selected by the Architect. The letters shall be 12" high and shall be furnished as indicated on the drawings.

3. Contractor to verify State and Local Building Codes for applicable Handicap signage for elevators, restrooms, etc. Manufacturer shall conform to Americans with Disabilities Act (ADA) requirement. ADA requirements shall supersede technical specifications in the Section.

10 14 00.03: EXECUTION

A. PLASTIC NUMBER/TITLE SIGNS

1. The exact titles, numbers, and symbols will be supplied to the Contractor in sufficient time to allow for fabrication and installation prior to occupancy. If fewer signs than indicated in these specifications are required, the cost difference will be returned to the Owner as a credit.

    a. Signs shall be mounted with double sided foam tape.
    b. All rooms where construction occurs will be identified unless existing identification exists.

B. PROJECT PLAQUE

1. General Contractor shall supply and install a project plaque. The plaque shall be cast bronze 24" x 18" (or 18" x 24") with beveled edge, concealed mounting, raised letters, and standard background finish. Plaque shall include Project name, Owner, School Board Members, School Superintendent, Date, Architect, and General Contractor. Letter size, style, background finish and colors to be selected by Architect.

C. BUILDING TITLE

1. Cast aluminum letters shall be installed in accordance with manufacturer's installation instructions.

DIVISION 10

SECTION 10 21 13.19: SOLID PLASTIC TOILET PARTITIONS

10 21 13.19.01: GENERAL

A. SCOPE

1. Furnish all labor, materials and equipment necessary to fabricate and install all toilet partitions stalls as indicated on the drawings and specified herein.

B. SUBMITTALS

1. All toilet partitions shall be the product of a single nationally recognized and reputable manufacturer, equal to ASI Global Partitions, Scranton Products (Santana-Comtec-Capital-Hiny Hiders) or Bradmar® by Bradley. Obtain approval of the Architect in writing prior to bid date for all other manufacturers.

2. Submit shop drawings showing all fabrication and installation details and submit manufacturer's data sheets for review.

3. Submit two copies of manufacturer's standard color chart for color selection. Colors will be selected by the Architect.

10 21 13.19.02: PRODUCTS

A. PARTITION TYPE

1. Toilet compartments shall be overhead braced, floor supported enclosures with pilasters extending from floor to headrails and with flush partitions and doors. Headrails shall be anti-grip style. Doors to physically handicapped compartments shall be width required by Code (minimum 32") and out-swinging unless otherwise indicated on the plans. All other doors shall be in-swinging.

2. Urinal screens will be floor mounted and overhead braced unless otherwise shown and noted.

3. Submit two copies of manufacturer's standard color chart for color selection. Colors will be selected by the Architect.

B. PARTITION CONSTRUCTION

1. All materials, panels, doors, pilasters, screens and benches shall be fabricated from polymer resins under high pressure to form a single component section that is waterproof, corrosion-proof, impact-resistant, and non-absorbent, and which has a self-lubricating surface that resists marking with pens, pencils, lipsticks, and other writing or marking implements.

2. All compartment edges shall be machined to a radius of .250" and all sharp corners removed. All dividing panels and doors shall be 55" high, and mounted 14" above finished floor.

3. All pilasters shall be 82" high and fastened to 3" high stainless steel shoes by means of theft-proof stainless steel sex bolts. To insure a mar-free finish, all plastic components are to be covered with protective film.

4. End panel to extend up and fasten into headrail.

5. Continuous wall brackets to be used for all connections to the walls.

6. Aluminum edging strips are to be fastened to the bottom edge of all doors and panels.

7. Panels will be factory prepared to receive surface mounted accessories, i.e. tissue dispensers, handrails, etc.

C. FABRICATION

1. Fabricate partitions straight, clean cut, and free from defects in workmanship, materials and appearance.

2. Miter corners of edge molding; weld and grind smooth.

3. Provide concealed reinforcement for tapping or rivet nuts where machine screws are required for fastening.

D. HARDWARE

1. Hinges, door latches, door strikes, and wall brackets shall be bright-dip anodized aluminum.

2. Fasteners, shoes and curtain hooks shall be stainless steel.

3. Headrail and shower curtain extrusion shall be heavy duty (6061-T6) anti-grip bright-dip anodized aluminum.

4. Door pulls, door stops, and bumper/hooks shall be of heavy chrome-plated zamac.

5. Hinges shall be Series 400.

6. Latches shall be Series 400, with emergency release operation.

7. Provide corrosion resistant, theft-resistant fasteners for exposed hardware and component connections, including compartment to walls.

E. ACCESSORIES

1. Provide paper holder and coat hook with bumper per Section 10 28 13 in addition to those standard accessories furnished by the manufacturer.

F. FINISHES

1. Partitions shall be solid plastic equivalent to ASI Global Partitions, Scranton Products (Santana-Comtec-Capital-Hiny Hiders) or Bradmar® by Bradley. Colors as selected by the Architect.

2. Stainless steel shall be No. 4 finish.

3. Exposed non-ferrous hardware and fittings not an integral part of partition door and pilaster shall be polished, nickel plated and chromium plated, or aluminum with satin clear anodized finish.

G. DELIVERY, STORAGE AND HANDLING

1. Deliver material in manufacturer's original unopened and undamaged packages. Clearly identify manufacturer, brand name, contents, color, stock number and order number on each package. Packages showing indications of damage that may affect condition of contents are not acceptable.

2. Store in original packaging under protective cover and protect from damage. Stack containers in accordance with manufacturer's recommendations.

3. Handle materials in such manner as to prevent damage to products or finishes.

10 21 13.19.03: EXECUTION

A. INSPECTION

1. Check areas to receive toilet partitions and screens for correct height and spacing of support structures and plumbing fixtures that may affect quality and execution of work. Commence installation of toilet partitions when all checks have been made. Start of work constitutes acceptance of job conditions.

B. INSTALLATION

1. Installation shall be in accordance with approved drawings and manufacturer's standard recommendations. Approved shop drawings to be submitted through subcontractor and manufacturer showing plans, elevations, and details prior to fabrication and installation.

2. Employ only mechanics experienced in installation of HDPE toilet partitions.

3. Anchor partitions, pilasters, and headrails to walls with brackets per manufacturer's details and recommendations.

4. Anchor pilasters to floor with adjustable, leveling type, corrosion resistant anchor plates and jackscrews.

5. Install hardware as recommended by manufacturer.

6. Conceal evidence of drilling in floors and walls in finished work.

7. Adjust pilaster shoes to fit flush with finish floors.

C. ADJUSTMENT AND CLEANING

1. Adjust brackets to provide uniform clearances not exceeding:

   a. Pilaster and wall - 1 in.
   b. Panels and wall - 1 in.
   c. Pilasters and panels - 1/2 in.
   d. Pilasters and doors - 3/16 in.

2. Adjust hardware for proper operation.

3. Set hinges to hold doors ajar when not latched.

4. After completion of installation, clean and polish exposed compartment and screen surfaces and touch-up minor scratches.

10 21 13.19.04: GUARANTEE

1. All solid plastic products to be warranted for a period of ten (10) years from date of Owner acceptance, against breakage, corrosion and delamination.

2. Labor and installation shall be warranted for a period of one (1) year from date of Owner acceptance. This covers replacement of faulty parts and materials or reinstallation of original work.

DIVISION 10

SECTION 10 22 39: OPERABLE WALL PARTITIONS

10 22 39.01: GENERAL

A. SUMMARY

1. This Section includes the following:
    a. Manually operated, paired panel partitions.

B. DEFINITIONS

1. NVLAP: National Voluntary Laboratory Accreditation Program.
2. STC: Sound Transmission Class.
3. NIC: Noise Isolation Class.

C. PERFORMANCE REQUIREMENTS

1. Acoustical Performance: Provide operable panel partitions tested by a qualified testing agency for the following acoustical properties according to test methods indicated:
    a. Sound Transmission Requirements: Operable panel partition assembly tested in a full-scale opening, 14 by 9 feet, for laboratory sound transmission loss performance according to ASTM E 90, determined by ASTM E 413, and rated for not less than the STC indicated.

D. SUBMITTALS

1. Product Data: Material descriptions, construction details, finishes, installation details and operating instructions for each type of operable panel partition, component and accessory specified. Include data on acoustical performance, surface-burning characteristics, and durability.
2. Shop Drawings: Show location and extent of operable panel partitions. Include plans, elevations, sections, details, attachments to other construction, and accessories. Indicate dimensions; weights; conditions at openings and for storage; and required installation, storage, and operating clearances. Indicate location and installation requirements for hardware and track, and direction of travel. Show blocking to be provided by others.
3. Setting Drawings: For embedded items and cutouts required in other work, including support beam punching template.
4. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for units with factory-applied color finishes.
5. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects

with project names and addresses, names and addresses of architects and owners, and other information specified.

6. Maintenance Data: For the following to include in maintenance manuals specified in Division 01:

   a. Panel Face finishes and finishes for exposed trim and accessories. Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.
   b. Seals, hardware, track, carriers and other operating components.

7. Product Certificates: Signed by manufacturers of operable panel partitions certifying that products furnished comply with requirements.

E. QUALITY ASSURANCE

1. Installer Qualifications: An experienced installer who is certified in writing by the operable panel partition manufacturer as qualified to install the manufacturer's partition systems for work similar in material, design and extent to that indicated for the Project.

   a. Upon request, provide a list of a minimum of three projects where the proposed project has been installed for a minimum of five years.
   b. Include partition size, model of panel and type of track.

2. Fire-Test-Response Characteristics: Provide operable panel partitions with the following fire-test-response characteristics, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

   a. Surface-Burning Characteristics: As follows, per ASTM E 84:

      1) Flame Spread: 25 or less.
      2) Smoke Developed: 50 or less.

   b. Fire Growth Contribution: Textile wall coverings complying with the acceptance criteria of UBC Standard 8-2.

F. DELIVERY, STORAGE AND HANDLING

1. Protectively package and sequence panels in order for installation. Clearly mark packages and panels with numbering system used on Shop Drawings.

G. PROJECT CONDITIONS

1. Field Measurements: Verify operable panel partition openings and storage arrangements by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

   a. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening and storage dimensions and proceed with fabricating operable panel partitions without field

measurements. Coordinate construction to ensure that actual opening dimensions correspond to established dimensions.

H. EXTRA MATERIALS

1. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

   a. Panel-Face Finish Material: Furnish full-width in quantity to cover both sides of one panel when installed.

10 22 39.02: PRODUCTS

A. MANUFACTURERS

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Kwik-Wall Co. (Basis of Design)
   b. Hufcor
   c. Advanced Equipment Company

B. OPERABLE PANEL PARTITIONS

1. General: Provide top reinforcement as required to support panel from suspension components and provide reinforcement for hardware attachment. Fabricate panels with tight hairline joints and concealed fasteners. Fabricate panels so finished in-place partition is rigid; level; plumb; aligned, with tight joints and uniform appearance; and free of bow, warp, twist, deformation, and surface and finish irregularities.

2. Panel Construction: Facing material to be bonded to rigid frame with horizontal and vertical elements formed of steel. Framing shall be fully unitized with overlapping and welded corners to create a rigid structure independent of panel skin and facing materials.

3. Dimensions: Fabricate operable panel partitions, from manufacturer's standard sizes, to form an assembled system of dimensions indicated on Drawings and verified by field measurements.

4. Operable Panel Partition Characteristics: Comply with requirements indicated in the Operable Panel Partition Schedule at the end of 10 22 39.03: EXECUTION.

5. Trim: Manufacturer's standard aluminum trim, color anodized, manufacturer's standard colors.

6. Hardware: Manufacturer's standard as required to operate operable panel partition and accessories; with decorative, protective finish.

C. SEALS

1. General: Provide types of acoustical seals indicated that produce operable panel partitions complying with acoustical performance requirements and the following:

   a. Seals made from materials and profiles that minimize sound leakage.
   b. Seals fitting tight at contact surfaces and sealing continuously between adjacent panels and between operable panel partition perimeter and adjacent surfaces, when operable panel partition is extended, closed and in place.

2. Vertical Seals: Deep-nesting, interlocking astragals mounted on each edge of panel, with continuous PVC acoustical seal.

3. Horizontal Top Seals: Continuous contact, flexible vinyl sweep seals installed on both sides of the panel.

4. Horizontal Bottom Seals: PVC-faced, mechanical, retractable, constant-force-contact seal exerting uniform constant pressure on floor when extended, ensuring horizontal and vertical sealing and resisting panel movement.

   a. Mechanically Operated: Extension and retraction of bottom seal by operating handle or built-in operating mechanism, with operating range not less than the 2-inch operating clearance between retracted seal and floor finish.

D. FINISH FACING

1. Shall be factory applied Class "A" rated material. Finish shall be Vinyl at 15 ozs. per linear yard selected by Architect from manufacturer's standard selection.

E. SUSPENSION SYSTEMS

1. Suspension Tracks: Steel or Aluminum with steel runners at trolley wheel locations with adjustable steel hanger rods for overhead support, designed for type of operation, size and weight of operable panel partition indicated. Size track to support partition operation and storage without damage to suspension system, operable panel partitions, or adjacent construction. Limit track deflection to no more than 0.10 inch between bracket supports. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.

2. Carriers: Trolley system utilizing steel ball bearing wheels as required for configuration type, size and weight of partition and for easy operation.

3. Track Intersections, Switches and Accessories: As required for type of operation, storage, track configuration, and layout indicated for operable panel partition and compatible with partition assembly specified.

F. ACCESSORIES

1. Pass Door. Provide Manufacturer's standard ADA compatible pass door. Provide where indicated on drawings.

10 22 39.03: EXECUTION

A. EXAMINATION

1. Examine flooring, structural support, and opening with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable panel partitions. Proceed with installation only after unsatisfactory conditions have been corrected.

2. General: Comply with ASTM E 557, operable panel partition manufacturer's written installation instructions, Drawings and approved Shop Drawings.

3. Install operable panel partitions and accessories after other finishing operations, including painting, have been completed.

4. Match operable panel partitions for color and pattern by installing panels from marked packages in numbered sequence indicated on Shop Drawings.

5. Broken, cracked, chipped, deformed or unmatched panels are not acceptable.

B. ADJUSTING

1. Adjust operable panel partitions to operate smoothly, easily and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and other moving parts.

C. CLEANING AND PROTECTION

1. Clean soiled surfaces, fabric facing, metal surfaces, work surfaces, on completing installation of operable panel partitions, to remove dust, fingerprints, adhesives, and other foreign materials according to manufacturer's written instructions.

2. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure operable panel partitions are without damage or deterioration at time of Substantial Completion.

3. Replace panels that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

D. DEMONSTRATION

1. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain operable panel partitions.

    a. Test and adjust seals, hardware, carriers, tracks, pass doors, operators and other operable components. Replace damaged or malfunctioning operable components.
    b. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
    c. Review data in maintenance manuals.

E. OPERABLE PANEL PARTITION SCHEDULE

1. Operable Panel Partition: Comply with the following:

   a. Partition Operation and Configuration: Manually operated, pair operated panels as indicated on drawings.
   b. Metal-Frame Panel Construction: Faced with ½" thick gypsum board.
   c. Panel Construction: Manufacturer's standard panel construction complying with requirements indicated.
   d. Panel Weight: 10 lb/sq. ft. maximum.
   e. Panel Thickness: Not less than 3 inches. Manufacturer verify door stack space available.
   f. Edges: Manufacturer's standard edge.
   g. Initial Closure: Flexible, resilient PVC, bulb-shaped acoustical seal.
   h. Final Closure: Constant-force, lever-operated, mechanical closure expanding from panel edge to create a constant-pressure acoustical seal.
   i. Finish Facing: Vinyl at 15 ozs. per linear yard.

      1) Color/Pattern: As selected by Architect from manufacturer's full range.

   j. STC: Not less than 49.

DIVISION 10

SECTION 10 28 13.13: TOILET ACCESSORIES

10 28 13.13.01: GENERAL

A. SCOPE

1. Furnish and install all toilet accessories as scheduled on the drawings and/or specified herein. Refer to drawings to clarify locations. Applicable items listed herein and not identified on drawings will be located by Architect.

B. SUBMITTALS

1. Submit manufacturer's catalog cuts and data sheets, a complete parts list, and installation requirements for each item specified.

C. COORDINATION

1. Coordinate size and location of reinforcement/blocking, cut-outs, etc. required with other affected trades.

10 28 13.13.02: PRODUCTS

A. MANUFACTURER

1. All toilet accessories supplied shall be the products of BOBRICK or Bradley Toilet Accessories, unless otherwise noted. All others must receive written prior approval from the Architect.

B. MATERIALS

1. Stainless steel shall be Type 304, conforming to ASTM A167-70 with a No. 4 satin finish, welded construction.

2. Tempered Glass (welded frame construction).

C. ACCESSORIES: All Model Numbers are BOBRICK products.

1. Grab Bars: B-5806 Series (for water closets/toilets; handicapped).

2. Stainless Steel Mirrors with tempered glass over Lavatories (screw locking design): B-2908-2436/(Bradley: 780-2436-2).

3. Shelf with Mop and Broom Holders and Rag Hooks: B-224 x 36.

4. Paper towel dispensers and receptacles, toilet tissue dispensers and soap dispensers shall be provided by the Owner and installed by the Contractor.

D. FASTENERS

1. Include fasteners and anchors for all accessories. Anchors, bolts, screws, etc. shall be of approved types, suitable for use with the various accessories and with the building construction to which items are to be attached.

E. DELIVERY, STORAGE AND HANDLING

1. Deliver items in manufacturer's original unopened protective packaging. Store materials in original protective packaging to prevent soiling, physical damage, or wetting. Handle so as to prevent damage to finished surfaces.

2. Maintain protective covers on all units until installation is complete. Remove protective covers at final clean-up of installation.

10 28 13.13.03: SCHEDULE

A. TYPICAL SCHEDULE

1. All individual Toilet Rooms: Toilet tissue holder, grab bar(s), paper towel dispenser and receptacle, mirror over lavatory and soap dispenser.

2. All Group Toilet Rooms: Toilet tissue holder per stall, mirror over each lavatory, grab bars at each H.C. stall, paper towel dispenser and receptacle. 1 soap dispenser per 2 lavatories.

3. Showers: Rod, soap dispenser, curtain and hooks.

4. Workrooms: One (1) Paper Towel Dispenser and one (1) Soap Dispenser per sink.

5. Janitor/Mop Sink: Shelf with Mop & Broom Holders and Paper Towel Dispenser.

10 28 13.13.04: EXECUTION

A. INSTALLATION

1. Check areas to receive surface mounted units for conditions that would affect quality and execution of work. Verify spacing of plumbing fixtures and toilet partitions that affect installation of accessories. Do not begin installation of toilet accessories until openings and surfaces are acceptable.

2. Install in a workmanlike manner. Attach each item securely to wall with wall anchors, expansion bolts, or as required by building conditions. Reinforcement of walls, which may be necessary for sound secure anchorage, shall be furnished as though specifically called for herein. Building damage occasioned by this work shall be repaired and refinished by and at expense of Contractor.

3. Adjust accessories for proper operation. After completion of installation, clean and polish all exposed surfaces. Deliver keys and instruction sheets to Owner.

4. All accessories are to be installed in a theft-proof manner with concealed fasteners or non-retractable fasteners.

5. If accessories are shown in a location which is difficult due to field conditions, the Architect will advise the Contractor as to the relocation of the units.

6. All accessories will be located so as to not be in violation of the state and local building code(s).

7. Toilet facilities must meet local and state building codes pertaining to accessibility by the handicapped (clearances, heights, shields, etc.).

DIVISION 10

SECTION 10 44 13: FIRE EXTINGUISHERS AND CABINETS

10 44 13.01: GENERAL

A. SCOPE

1. Furnish and install fire extinguishers and fire extinguisher cabinets as indicated on the drawings and specified herein.

B. SUBMITTALS

1. Submit shop drawings in accordance with SECTION 01 33 00: SHOP DRAWINGS.

10 44 13.02: PRODUCTS

A. CABINETS

1. The fire extinguisher cabinets indicated on the drawings shall be similar to J. L. Industries - Academy, Larsen's or equal. The extinguishers for these cabinets will be furnished by the General Contractor.

2. Quantity - Fifteen (15) cabinets and extinguishers.

10 44 13.03: EXECUTION

A. INSTALLATION

1. Install fire extinguisher cabinets in strict accordance with the manufacturer's instructions.

2. Local Fire Marshal will advise as to exact location of cabinets. If more cabinets are required by the Fire Marshal than are shown, Owner will furnish and General Contractor will install additional cabinets.

DIVISION 10

SECTION 10 51 00: LOCKERS

10 51 00.01: GENERAL

1. Furnish all labor, material, and equipment to install the benches and lockers where shown and/or noted.

2. Shop drawings required.

10 51 00.02: PRODUCTS

1. Lockers will have standard louvered doors, sloped top, and 4" high solid base. They shall be equal to steel lockers by Lyon. Provide a number plate for each door, lift-release door latches with provisions for padlocks, and shelf with a double ceiling hook in each locker. Submit optional color samples for selection by the Architect. Submit the manufacturer's data for approval prior to ordering. Provide finished sides where exposed.

2. Typical Locker Sizes: (Plans will verify or alter).

    a. Kitchen Employees: 12 - 12" wide x 18" deep x 36" (Double Tier)

10 51 00.03: EXECUTION

1. Lockers will be delivered to the job site in the manufacturer's cartons and will be stored in accordance with the manufacturer's specifications.

2. The lockers will be anchored to the floor and wall (if located against a wall, see plans) using the manufacturer's anchoring devices and suggested fasteners. See details of locker bases.

DIVISION 10

SECTION 10 56 00: STORAGE AND SHELVING ASSEMBLIES

10 56 00.01: GENERAL

A. SCOPE

1. The work covered by this section of the specifications shall consist of furnishing all labor, materials, equipment, scaffolding, etc., in connection with the complete installation, ready for use, of the items specified herein in strict accordance with this section of the specifications, the general conditions, and the applicable drawings. This Contractor must furnish and properly erect in a true and workmanlike manner, with the necessary and proper nails and screws, all finishing materials as noted on the drawings as being furnished by the Contractor. All shall be left in perfect and acceptable condition.

B. SUBMITTALS

1. Before proceeding with storage and shelving assembly work, submit shop drawings for all items, identified with quality, grade, type of finish and species of wood and metal types. Show items in related and dimensional position with sections either full size or three (3) inches equal one (1) foot scale.

10 56 00.02: PRODUCTS

A. WOOD SHELVING - FREE STANDING

1. Acceptable Manufacturer: Palmetto Shelving Systems, Inc. or equal. Excalibur Shelving Systems, Standard Pine as Basis of Design.

2. Uprights: Premium Grade Western Hemlock (1-1/2" x 1-5/16").

   a. 3/8" x 5/8" deep plow entire length of stiles to receive shelf end channels with 3/16" drilled holes on 1" centers.
   b. Stiles are to be locked together with three or more cross members mortised glued and pinned into the stiles.
   c. All components are to be machined smooth with all outside corners eased.
   d. Uprights to be 84" H unless otherwise noted by plans.

3. Shelves: ¾" pine shelf materials are to be machined to accept roll formed steel end channels shaped to fit over each end of the shelf and to rest on the shelf support pins. Finger joints are not acceptable.

   a. Seven (7) shelves per section unless otherwise indicated on plans.

4. Shelf Support Pins: Non-rusting alloy, 3/16" diameter x 1-1/4" long, 5/16" diameter head.

5. "X" Braces: Two 18-gauge galvanized ¾" steel straps with holes punched at each end. Rivet straps at centers. Provide as manufacturer recommends for stability.

6. Back Panels: All back-to-back units for book storage to have 1/8" Abitibi S2S tempered hardboard back panels.

7. Kickboard: Provide a continuous prefinished 4" pine kickboard for each elevation.

8. Finish: Shelving up to 28" D shall have a UV Finish, shelving deeper than 28" D shall be factory seal and lacquer (site finish is not acceptable).

B. METAL SHELVING - WALL-MOUNTED

1. Acceptable Manufacturer: E-Z Shelving Systems, Inc. or equal (Basis of Design).

2. Uprights for Wall-Mounted Storage: 14-Gauge rolled steel channels, continuously seam-welded electro-zinc plated and chromate dipped to ensure against rust and corrosion, punched to accept ¼" lag screws, bolts, etc., for mounting to walls. Mounting holes shall begin 2" from end.

3. Brackets: Brackets shall support two adjoining shelves on a common upright. Brackets shall have a 14-gauge steel plate welded to its top horizontal flange and shall be electro-zinc plated and chromate dipped to protect all sheared edges.

4. Shelving: To be constructed of 16-gauge G-90, LFQ, ASTM A-653 galvanized sheet, with front and rear edges flanged in two directions to provide structural rigidity, and to withstand shelf failure. (Standard finish or as indicated on the drawings)

C. METAL WIRE SHELVING - FREE STANDING

1. Acceptable Manufacturer: Eagle Group wire shelving or equal (Basis of Design).

2. Posts: Shall be one-inch (1") round posts, minimum 16-gauge.

3. Shelving: Stainless steel wire.

10 56 00.03: EXECUTION

A. CONDITION OF SURFACES

1. Examine all grounds, stripping and blocking used to secure wood and metal shelving units. Do not begin installation until all defects are corrected.

B. INSTALLATION

1. All items shall be erected plumb, level and true to line; shall be properly braced; and shall be securely anchored in place.

2. Installation shall be in accordance with approved drawings and manufacturer's standard recommendations. Approved shop drawings to be submitted through subcontractor and manufacturer showing plans, elevations and details prior to fabrication and installation.

DIVISION 10

SECTION 10 71 13: EXTERIOR SUN CONTROL DEVICES

10 71 13.01: GENERAL

A. SCOPE

1. Section includes the design, fabrication and installation of welded extruded aluminum sun control assemblies, complete as indicated on the drawings and specified herein. Products furnished but not installed under this section: anchors.

B. SYSTEM DESCRIPTION

1. Design requirements: Provide sun control devices capable of withstanding the effects of loads and stresses from dead loads, live loads, now loads, snow drift loads, wind loads, and normal thermal movement without evidencing permanent deformation of assembly or components including blades, frames and supports; noise or metal fatigue caused by blade rattle or flutter; or permanent damage to fasteners and anchors. Comply with applicable codes.

C. SUBMITTALS

1. Submit shop drawings showing complete manufacturer's product information, specifications, and installation instructions for sun control devices, anchors and accessories in accordance with requirements of Shop Drawings Section of Division 01.
2. Shop Drawings: Include plan dimensions, elevations, and details. Include details showing profiles, angles and spacing of blades, frames and supports. Include unit dimensions related to supporting and adjoining structure. Include anchorage details and locations.
3. Samples: Color selection samples consisting of actual coating material or anodizing process on aluminum extrusions.

D. QUALITY ASSURANCE

1. Overall Standard: Structural engineering design documents stamped by a structural engineer registered to practice in the state of North Carolina.
2. Manufacturer Qualifications: Minimum of five (5) years' experience in the design, fabrication, and erection of exterior sun control devices.
3. Installer Qualifications: Minimum of two (2) years' experience in erecting exterior sun control devices of the type specified.

D. PROJECT CONDITIONS

1. Field Measurements: Verify actual supporting and adjoining construction by field measurements before fabrication and indicate recorded measurements on Shop Drawings. Coordinate construction to ensure that sun control devices fit properly to supporting and adjoining construction and coordinate schedule with construction progress to avoid delaying the Work.

E. DELIVERY, STORAGE AND HANDLING

1. All material shall be delivered to the job site and stored under cover in a manner that will prevent rust and damage.

10 71 13.02: PRODUCTS

A. MATERIALS

1. Aluminum Extrusions: ASTM B 221, 6063 alloy, T-5 or T52 Temper.

2. Factory finish: Two coat fluoropolymer (Kynar 500) finish.

3. Blades and Outriggers: Manufacturer's standard extruded aluminum.

4. Fascia: Manufacturer's standard extruded aluminum fascia sections.

B. MANUFACTURERS

1. Peachtree Protective Covers (Basis of Design)

2. Dittmer Architectural Aluminum

3. Perfection Architectural Systems, Inc.

4. Mapes Architectural Canopies

10 71 13.03: EXECUTION

A. EXAMINATION

1. Verification of Conditions: Verify that all concrete, masonry and roofing work in the vicinity is complete and cleaned.

2. Coordinate with responsible trade to perform corrective work on unsatisfactory surfaces.

3. Commencement of work by installer is acceptance of existing conditions.

B. ERECTION

1. Install sun control devices level, plumb, and in indicated alignment with adjacent work.

2. Conceal anchorages where possible.

3. Repair damaged finishes so that no evidence remains of corrective work. Return items that cannot be refinished in the field to the shop. Make required alterations and refinish entire unit or replace unit.

4. Keep aluminum surfaces from direct contact with ferrous metal or other incompatible materials by applying one coat of clear acrylic coating.

C. CLEANING

1. Clean surfaces soiled by work as recommended by manufacturer.

2. Remove surplus materials and debris from the site.

D. PROTECTION

1. Protect finished aluminum surfaces from damage due to subsequent construction operations and until acceptance by Owner.

DIVISION 10

SECTION 10 73 00: ALUMINUM CANOPY

10 73 00.01: GENERAL

A. SCOPE

1. Furnish and install pre-engineered, pre-finished extruded aluminum walkway canopies with internal gutters, complete as indicated on the drawings and specified herein.

B. SUBMITTALS

1. Submit shop drawings showing complete fabrication and installation details in accordance with requirements of Shop Drawings Section of Division 01.

2. Shop Drawings: Layout and erection drawings showing roof framing, deck panels, cross sections, and trim details, clearly indicating proper assembly.

3. Samples: Color selection samples consisting of actual coating material or anodizing process on aluminum extrusions.

C. QUALITY ASSURANCE

1. Overall Standard: Structural engineering design documents stamped by a structural engineer registered to practice in the state of North Carolina.

2. Manufacturer Qualifications: Minimum of five (5) years experience in producing covers/canopies of the type specified.

3. Installer Qualifications: Minimum of two (2) years experience in erecting covers/canopies of the type specified.

D. DELIVERY, STORAGE AND HANDLING

1. All material shall be delivered to the job site and stored under cover in a manner that will prevent rust and damage.

10 73 00.02: PRODUCTS

A. MATERIALS

1. Aluminum Extrusions: 6063 alloy, T-6 Temper.

2. Factory finish: Two coat fluoropolymer (Kynar 500) finish.

3. Columns: Radius-cornered aluminum tubular extrusions.

4. Beams: Open top aluminum tubular extrusions.

5. Deck: extruded aluminum.

6. Fascia: Manufacturer's standard extruded aluminum fascia sections.

B. MANUFACTURERS

1. Peachtree Protective Covers

2. Dittmer Architectural Aluminum

3. Perfection Architectural Systems, Inc.

4. Mapes Architectural Canopies

10 73 00.03: EXECUTION

A. EXAMINATION

1. Verify locations and elevations.

2. Examine building surfaces to which canopy will connect.

3. Coordinate with responsible trade to perform corrective work on unsatisfactory surfaces.

4. Commencement of work by installer is acceptance of existing conditions.

B. ERECTION

1. Erect protective covers in accordance with manufacturer's installation instructions.

2. Set plumb, straight, and true to line, adequately braced to maintain position.

3. Keep aluminum surfaces from direct contact with ferrous metal or other incompatible materials by applying one coat of clear acrylic coating.

C. CLEANING

1. Clean surfaces soiled by work as recommended by manufacturer.

2. Remove surplus materials and debris from the site.

D. PROTECTION

1. Protect finished aluminum surfaces from damage due to subsequent construction operations and until acceptance by Owner.

DIVISION 10

SECTION 10 75 00: FLAGPOLE

10 75 00.01: GENERAL

A. SCOPE

1. Furnish all labor, materials and equipment necessary to install the metal flagpole as indicated on the drawings and specified herein.

B. DESIGN CRITERIA

1. The flagpole, base and anchorage devices shall be designed to resist a wind velocity of at least 140 MPH and in accordance with all applicable local governing codes.

C. SUBMITTALS

1. Submit 3 sets of shop drawings of the flagpole, base and all fittings.

2. Submit a 2" x 4" sample of the actual flagpole finish.

3. Furnish two copies of the manufacturer's specification and installation instructions for the flagpole, base and all required fittings.

10 75 00.02: PRODUCTS

A. FLAGPOLE

1. Provide the flagpole as complete unit by a single approved manufacturer, including base, anchorage and fittings equal to The Flagpole Co Model #EHH358250.

2. The flagpole shall be fabricated of heat-treated and age-hardened 6063-T6 seamless extruded aluminum tubing with an anodized finish to be selected by the Architect. The flagpole shall consist of a tapered section above a cylindrical butt section. Include cylinder locking cleat cover for flag security. Overall height shall be 35'-0" with a setting depth of 3'-6" as detailed on the drawings.

B. BALL

1. Ball shall be aluminum with a gold anodized finish.

C. BASE AND ANCHORAGE

1. Flagpole base shall be a round profile type cast aluminum slip collar with an anodized finish to be selected by the Architect. Base shall be sized to accommodate the butt diameter of the flagpole.

2. The foundation sleeve shall be fabricated of 16 ga. corrugated galvanized tube steel and shall be welded to a steel plate sized according to manufacturer's specifications. Internal steel wedges shall be welded to the support plate and foundation sleeve to permit centering of the flagpole. A 3'-0" long 3/4" steel ground spike shall be welded to the sleeve plate.

DIVISION 11

SECTION 11 40 00: FOOD SERVICE EQUIPMENT

11 40 00.01: GENERAL

A. RELATED DOCUMENTS

1. The general provisions of the contract including general and supplementary conditions and general requirements apply to the work specified in this section.

B. RELATED WORK SPECIFIED ELSEWHERE

1. Plumbing: Refer to Division 22, including:
   a. Rough-in piping for gas and water supply and waste lines.
   b. Piping for supply and waste lines.
   c. Traps, grease traps, line strainers, tail pieces, valves, stops, shut-offs and miscellaneous fittings required for complete installation.
   d. Final connections.

2. Mechanical: Refer to Division 23, including:
   a. Roof mounted fans and connecting ductwork not shown as part of the kitchen equipment.
   b. Final connections, including approved welded duct connections to hoods.

3. Electrical: Refer to Division 26, including:
   a. Rough-in conduit, wiring, line and disconnect switches, safety cut-offs and fittings, control panels, fuses, boxes and fittings required for complete installation.
   b. Final connections, including mounting and wiring of switches furnished as part of the food service equipment (unless otherwise indicated on the drawings).

C. WORK INCLUDED THIS SECTION:

1. Furnish and install all food service equipment as specified herein, including that which is reasonably inferred, with all related items necessary to complete work shown on contract drawings and/or required by these specifications.

2. Electrical Work:
   a. Inner wiring of food service equipment between components within equipment, such as heating elements, switches, thermostats, motors, etc., complete with junction box as is applicable, ready for final connection.
   b. Voltages shall be as indicated on contract drawings. Any differences in electrical characteristics at job site from those shown on contract documents must be submitted to Architect for consideration prior to ordering equipment.

3. Plumbing Work:

   a. Furnish all equipment with faucets, sink waste assemblies, and trim as specified in this section.
   b. Extend all indirect waste lines to nearest floor receptor. All such drain lines to be properly sized and chrome plated where exposed to public view. Drain shall terminate with proper air gap above flood rim of floor receptor.

4. Mechanical Work:

   a. Provide exhaust hoods with connection collars ready for final connection by HVAC Section.
   b. Provide stainless steel exposed ducts to ceiling for dishmachine.

D. QUALITY ASSURANCE

1. It is required that all custom fabricated equipment such as food serving units, tables, sinks, counter tops, etc., be manufactured by a food service equipment fabricator who has the plant, personnel and engineering equipment required. Such manufacturer shall be subject to approval of Architect. All work in above category shall be manufactured by one manufacturer, and shall be of uniform design and finish.

2. Manufacturer of this equipment must be able to show that he is now and for the past five years has been engaged in manufacture or distribution of equipment, as required under this contract, as his principal product.

3. Manufacturer of equipment herein specified shall be a recognized distributor for items of equipment specified herein which are of other manufacture than his own.

4. Only manufacturers who can meet the foregoing qualifications will be acceptable.

5. All work shall be done in an approved workmanlike manner, to the complete satisfaction of the owner.

E. SUBMITTALS

1. Submit shop drawings as required by General Conditions. All shop drawings and rough-in drawings shall be CAD drafted. Hand drawings are not acceptable.

2. Shop drawings and bound brochures covering manufactured or "buy-out" items covering all work and equipment included in this contract shall be submitted to Architect as soon as possible after award of contract. After approval, Food Service Equipment Contractor shall furnish to Architect sets of shop drawings and brochures, corrected as required by virtue of review comments, for distribution to various interested trades on project. All costs of reproduction and submission shall be part of contract.

3. Provide fully dimensioned rough-in plans at 1/4" scale, consisting of a separate drawing for each discipline. Each drawing shall show equipment shaded down 50%. Rough-in set shall include all required mechanical, electrical, plumbing, services for equipment and dimensioned rough-in location for same. Rough-in locations shown shall make allowances for required traps, switches, etc., thereby not requiring

interpretation or adjustment on the part of other Contractors. Drawings shall indicate dimensions for floor depressions, wall openings, etc., for equipment.

Food Service Equipment Contractor shall visit site to verify all rough-in and sleeve locations prior to installation of finished floors, and shall cooperate with other Contractors involved in proper location of same. Food Service Equipment Contractor shall be responsible for any required relocations of rough-in due to errors or inaccuracies on those rough-in plans which he prepares.

4. Rough-in plans shall include all required services which relate to equipment but which may not directly connect thereto, such as convenience outlets at walls, hose stations, floor drains, etc.

5. Rough-in plans shall also include all required outlet services for equipment which is designated on drawing schedule, even though such equipment may not be included in this contract.

6. Fully dimensioned and detailed shop drawings of custom fabricated equipment items shall be submitted, drawn at 3/4" and 1 - 1/2" scale for plans, elevations and sections respectively. Drawings shall show all details of construction, installation, and relation to adjoining and related work where cutting or close fitting is required. Drawings shall show all reinforcements, anchorage, and other work required for complete installation of all fixtures.

7. Do not begin fabrication of custom manufactured equipment until approvals of shop drawings have been received and until field measurements have been taken by Food Service Equipment Contractor, where such measurements are necessary to assure proper conformance with intent of contract drawings and specifications.

8. Make field measurements, giving due consideration to any architectural, mechanical, or structural discrepancies which may occur during construction of building. No extra compensation will be allowed for any difference between actual measurements secured at job site and dimensions indicated on contract drawings. Any differences which may be found at job site during field measurements shall be submitted to Architect for consideration before proceeding with fabrication of equipment.

9. Submit illustrative brochures for manufactured or "buy-out" equipment items, complete with illustrations, specifications, line drawings, rough-in requirements, and list of accessories or other specified additional requirements. Brochures shall be bound and shall include data on all equipment which is to be provided, arranged in numerical sequence which conforms to item numbers of specifications. Omission of data does not reduce obligation to provide items as specified.

10. Approval of shop schedules and brochures will be in general and shall be understood to mean that Architect has no objection to use of materials or processes shown. Approval does not relieve Food Service Equipment Contractor from responsibility for errors, omissions, or deviations from contract requirements.

F. SUBSTITUTIONS - STANDARDS

1. Refer to Instructions to Bidders and Division 01 for requirements.

G. DRAWINGS

1. Drawings which constitute part of contract documents indicate general arrangement of piping and location of equipment. Should it be necessary to deviate from arrangement indicated in order to meet structural conditions, make such deviations without expense to Owner.

2. Specifications and drawings are reasonably exact, but their extreme accuracy is not guaranteed. Drawings and specifications are for assistance and guidance of Contractor, and exact locations, distances and levels shall be governed by the building.

H. MANUFACTURER'S DIRECTIONS

1. Follow manufacturer's directions in all cases where manufacturers of articles used in this contract furnish directions or prints covering points not shown on drawings or specifications.

I. INDUSTRY STANDARDS

1. Electric operated and/or heated equipment, fabricated or otherwise, shall conform to latest standards of National Electric Manufacturers Association and of Underwriters Laboratories, Inc., and shall bear the U.L. label.

2. Items of food service equipment furnished shall conform to standards of National Sanitation Foundation, Ann Arbor, Michigan, and shall bear the N.S.F. seal.

3. Food service equipment shall be installed in accord with N.S.F. standards.

4. Work and materials shall be in compliance with requirements of applicable codes, ordinances and regulations, including but not limited to those of Occupational Safety and Health Act (OSHA), National Fire Protection Association, State Fire Marshal, State Accident Commission, U.S. Public Health Service, State Board of Health, local health codes, etc.

5. No extra charge will be paid for furnishing items required by regulations, even though such may not be shown on drawings or called for in these specifications.

6. Rulings and interpretations of enforcing agencies shall be considered part of regulations.

11 40 00.02: PRODUCTS

A. MANUFACTURED EQUIPMENT

1. Except as may be specified otherwise under individual item specifications in "Equipment Schedule", all items of standard manufactured equipment shall be complete in accord with manufacturer's standard specification for specific unit or model called for, including finishes, components, attachments, appurtenances, etc., except as follows:

2. All items of standard equipment shall be that manufacturer's latest model at time of delivery.

3. Substitutions for manufactured equipment specified will be accorded consideration under terms set forth in "Substitutions - Standards".

B. FABRICATED EQUIPMENT

1. Stainless steel shall be U.S. standard gauges as called for, 18-8, Type 302, or 304 type, No. 4 finish.

2. Galvanized iron shall be Armco or equal. Framework of galvanized iron shall be welded construction, having welds smooth, and where galvanizing has been burned off, touched up with high grade aluminum bronze.

3. Legs and crossrails shall be continuously welded, unless otherwise noted, and ground smooth.

4. Bottom of legs at floor shall be fitted with sanitary stainless-steel bullet type foot, with not less than 2" adjustment.

5. Legs shall be fastened to equipment as follows:

   a. To sinks by means of closed gussets. Gussets shall be stainless steel, reinforced with bushing, having set screws for securing legs.
   b. To tables and drainboards with closed gussets which shall be welded to stainless steel hat sections or channels, 14 gauge or heavier, exposed hat sections having closed ends. Bracing shall be welded to underside of tops.

6. Closed gussets shall be a 3" minimum diameter at top, continuously welded to frame members or to sink bottom.

7. Sinks, unless otherwise specified, shall be furnished with rotary type waste outlets, without connected overflows: Atlantic Brass Works Model 772-RB; Fisher Brass Foundry Model 250A; T&S; or approved equal. Where exposed, furnish wastes chromium plated.

8. Rolls shall be 1 1/2" diameter, except as detailed contrary, with corners bullnosed, ground and polished.

9. Seams and joints shall be shop welded. Welds to be ground smooth and polished to match original finish. Materials 18 gauge or heavier shall be welded.

10. Metal tops shall be one-piece welded construction, unless specified otherwise, reinforced on underside with stainless steel hat sections or channels welded in place. Crossbracing to be not more than 30" on centers.

11. Drawers to be 18-gauge stainless steel channel type housing and drawer cradle, both housing and cradle being reinforced and welded at corners, housing being secured to the underside of table top, and both housing and cradle being sized for and fitted with 18-gauge 20" x 20" x 5" deep stainless-steel drawer insert having coved corners. Drawer insert shall be easily removable from cradle without tools or

having to remove entire drawer. Drawers to have stainless steel fronts. Provide with recessed flush type stainless steel pulls.

12. Support drawer on fabricated 14-gauge stainless steel interlocking channel supports with eight solid delrin ball bearing wheels. Support slides shall be load rated at 200 lb. per pair. Slides to be component hardware S52 Series.

13. Enclosed cabinet type bases shall be made of formed steel sheets reinforced with formed steel sections to create a rigid structure. Steel shall be 18 gauge or heavier. Base shall be welded construction throughout with front rails, mullions, etc., welded to appear as one-piece construction. All exposed sections of interior and exterior shall be stainless steel, and unexposed sections shall be galvanized steel, unless specified contrary.

14. Doors shall be double cased, unless otherwise noted. Outer pans shall be 18 gauge with corners welded, ground smooth, and polished. Inner pans shall be 20 gauge, fitted tightly into outer pan with sound-deadening material such as Celotex used as core. Two pans shall be tack-welded together with seam solder filled. Door shall finish approximately 3/4" thick and shall be fitted with flush recessed type stainless steel door pulls. Single pan type doors shall be reinforced and stiffened with closed hat sections.

15. Hinged doors shall be flush type mounted on heavy-duty stainless-steel piano or concealed hinges.

16. Hardware shall be solid materials and except where unexposed or specified contrary, of cast brass, chrome plated. Stampings are not acceptable. Identify all hardware with manufacturer's name and number so that broken or worn parts may be ordered and replaced.

17. Fabricate sink compartments with fully coved vertical and horizontal corners. Multiple compartment partition to be double thickness, continuously welded where sheets join at top. Front of multiple compartment sinks to be continuous on exterior. Bottoms shall be creased to drain.

18. Ends of all fixtures, splashbacks, shelves, etc., shall be finished flush to walls or adjoining fixtures.

19. Dishtables, draintables, splashbacks and turned-up edges shall have radius bends in all horizontal and vertical corners, coved at intersections.

20. Rounded and coved corners or radius bends shall be 1/2" radius or longer.

21. Shelves in fixtures with enclosed bases shall be turned up on back and sides and feathered slightly to insure tight fit to enclosure panels. Bottom shelves shall be made for easy removal unless otherwise noted.

22. Undersides of tops to be coated with heavy-bodied resinous material compounded for permanent, non-flaking adhesion to metal, 1/8" thick, applied after reinforcing members have been installed, drying without dirt-catching crevices.

23. Metal components, unless specified or noted otherwise, to be the following gauges:

Counter and table tops	14 ga. Stainless Steel
Wall shelves	16 ga. Stainless Steel
Pipe leg undershelves	16 ga. Stainless Steel
Drawer fronts	16 ga. Stainless Steel
Enclosed cabinet bases	18 ga. Stainless Steel
Sinks and drainboards	14 ga. Stainless Steel
Exhaust hoods	18 ga. Stainless Steel
Legs 1 - 5/8" diameter	16 ga. Stainless Steel
Doors (outer pan)	18 ga. Stainless Steel
Doors (inner pan)	20 ga. Stainless Steel

C. HEATING EQUIPMENT

1. Wherever electric heating equipment or thermostat control for such equipment is specified, it shall be complete, and of the materials, size and rating specified within equipment item or details. All such equipment shall be designed and installed to be easily cleaned or to be easily removed for cleaning.

2. Electrical appliances or heating element circuits of 120 volts shall not exceed 1650 watts, unless specifically shown contrary.

D. SWITCHES AND CONTROLS

1. Food Service Equipment Contractor shall supply on each motor driven appliance or electrical heating unit suitable control switch of proper type in accord with Underwriter's Code.

2. All internal wiring for fabricated equipment items included, all electrical devices, wiring, controls, switches, etc., built into or forming an integral part of these items shall be furnished and installed by Food Service Equipment Contractor in his factory or building site with all items complete to junction box for final connection to building lines by Electrical Contractor.

3. Provide standard 3-prong plugs to fit "U" slot grounding type receptacles, similar to No. 5262, for all equipment items powered by plugging into 110-120 volts, single phase AC. Also, provide suitable length 3-wire cord for equipment.

E. CONNECTION TERMINALS

1. All equipment shall be complete with connection terminals as standardized by equipment manufacturers, except where specified otherwise.

F. LOCKS

1. Fit all doors for reach-in refrigerated compartments with locking type latches approved in writing by Architect. Provide master keys.

G. LAMINATED PLASTIC

1. Wherever laminated plastic materials are specified, they shall be Formica, Parkwood, Micarta, or approved equal. Veneer all materials using urea base cement, waterproof and heatproof.

11 40 00.02: EXECUTION

A. GENERAL

1. Work under this contract and covered under this section of specifications includes but is not limited to:

   a. Cutting of holes and/or ferrules on equipment for piping, drains, electrical outlets, conduits, etc. as required to coordinate installation of food service equipment with work of other Contractors on project.
   b. Field checking of building and rough-in requirements, and submission of brochures and shop drawings, all as required hereinbefore under "Submittals".
   c. Repair of all damage to premises as result of this installation, and removal of all debris left by those engaged in this installation.
   d. Having all food service equipment fixtures completely cleaned and ready for operation when building is turned over to Owner.

B. INSTALLATION PROCEDURES

1. Food Service Equipment Contractor shall make arrangements for receiving his custom fabricated and "buy out" equipment and shall make delivery into building as requisitioned by his installation superintendent. He shall not consign any of his equipment to Owner or to any other Contractor unless he has written acceptance from them and has made satisfactory arrangements for the payment of all freight and handling charges.

2. Food Service Equipment Contractor shall deliver all of his custom fabricated and "buy out" equipment temporarily in its final location, permitting Trades to make necessary arrangements for connection of service lines; he shall then move equipment sufficiently to permit installation of service lines, after which he shall realign his equipment level and plumb, making final erection as shown on contract drawings.

3. All portable or counter mounted equipment weighing in excess of 25 pounds shall be mounted on 4" stainless steel adjustable legs.

4. This Contractor shall coordinate his work and cooperate with other trades working at site toward the orderly progress of the project.

5. Architect or Owner's Agent shall have access at all times to plant or shop in which custom fabricated equipment is being manufactured, from time contract is let until equipment is shipped, in order that progress of work can be checked, as well as any technical problem which may arise in coordination of equipment with building. Any approval given at this point of manufacture shall be tentative, subject to final inspection and test after complete installation.

6. Food Service Equipment Contractor shall assist Architect, Owner, and/or Owner's Agent in making any desired tests during or prior to final inspection of equipment; he shall remove immediately any work or equipment rejected by Architect, Owner, and/or Owner's Agent, replacing same with work conforming with contract requirements, and shall reimburse mechanical and/or other contractors involved for extra work made necessary by such replacement.

7. This Contractor shall keep premises free from accumulation of his waste material and rubbish, and at completion of his work shall remove his rubbish and implements, leaving areas of his work broom clean.

8. This Contractor shall provide and maintain coverings or other approved protection for finished surfaces and other parts of his equipment subject to damage during and after erection. After removal of protective coverings, all field joints shall be ground and polished and entire work shall be thoroughly cleaned and polished.

C. TRIMMING AND SEALING EQUIPMENT

1. Seal completely spaces between all units to walls, ceilings, floors, and adjoining (not portable) units with enclosed bodies against entrance of food particles or vermin by means of trim strips, welding, soldering, or commercial joint material best suited to nature of equipment and adjoining surface material.

2. Close ends of all hollow sections.

3. Equipment butting against walls, ceilings, floor surfaces and corners to fit tightly against same; backsplashes or risers which fit against wall to be neatly scribed and sealed to wall with Dow Corning #732 RTV or General Electric clear silicone sealant, wiping excess sealant out of joint to fillet radius. Where required to prevent shifting of equipment and breaking wall seal, anchor item to floor or wall.

4. Treat enclosed spaces (inaccessible after equipment installation) by covering horizontal surfaces with powdered borax at a rate of 4 oz. per square foot.

D. TESTING AND DEMONSTRATION OF EQUIPMENT

1. After completion of installation, all equipment using water, gas, and electricity shall be performance inspected and tested by factory certified service agent. Food Service Equipment Contractor shall document that these inspections have been performed prior to scheduling demonstrations and owner acceptance of equipment.

2. Food Service Equipment Contractor shall arrange to have all manufactured, mechanically operated equipment furnished under this contract demonstrated by authorized representatives of equipment manufacturers, these representatives to instruct Owner's designated personnel in use, care and maintenance of all items of equipment after same are in working order. Demonstration and instruction shall be held on dates designated by Owner.

3. Food Service Equipment Contractor shall provide a competent service representative to be present when installation is put into operation.

E. EQUIPMENT HANDLING AND STORAGE

1. Deliver equipment to site, properly crated and protected, and store in safe place, protected from damage until time for installation.

F. GUARANTEE

1. Special Project Warranty: Provide written warranty, signed by manufacturer, agreeing to replace/repair, within warranty period, with inadequate and defective materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required, provided manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty period. This warranty shall be in addition to, and not limitation of, the rights the Owner may have against the Contractor under the Contract Documents.

2. Warranty Period:

   One (1) year from date of Substantial Completion, all new equipment furnished. However, manufacturer's warranty shall prevail when the period is longer than one year.

   5-year warranty period on refrigeration compressors.
   10-year warranty period on walk-in panels.

G. OPERATING AND MAINTENANCE MANUALS

1. After completion of installation, Food Service Equipment Contractor shall present to Owner three sets of all operating and maintenance manuals, covering all mechanically operated equipment furnished under this contract, each set being neatly bound in loose-leaf binder having durable cover.

2. Include in each binder a list of names, addresses and telephone numbers of local servicing agencies authorized to make necessary repairs and/or adjustments of equipment furnished under this contract.

11 40 00.04: SCHEDULE

A. ITEM NO. 1 & 2: Walk-In Cooler and Freezer
Cooler - Model Number: Imperial Brown
Freezer – Model Number: Imperial Brown

Furnish and install the walk-in cooler/freezer complete with floor, wall, and ceiling as shown on the drawings. The cabinet shall be constructed of modular, prefabricated panels to the dimensions shown on the floor plans. Height above finish floor shall be 8'-7-3/4".
Provide and install stainless steel trim, matching the front of the sections, to cover the spaces between the walk-in box and adjacent building finishes. The kitchen ceiling height will be approximately 10'-0". Verify building conditions before fabricating trim. The panels shall consist of interior and exterior metal pans, which are accurately and precisely formed to assure a constant uniformity.

The insulation shall be "Foamed-In-Place" rigid urethane and will completely adhere to the interior of the metal pans and to the cam-action locking devices. Insulation shall provide an initial thermal conductivity factor (K) of not more than 0.110 and not more than 0.118 after curing. Overall coefficient of heat transfer (U-factor) shall not be more than .029.

The R-factor shall have a value of 35. Insulation shall have 97% closed cell structure, average in-place density of 2.3 lbs. per cubic foot, and compression strength of yield point of 30 lbs. per cubic inch. Overall thickness shall be 4". The panels shall have no wood or metal structural members. All panels shall have tongue and groove edges, which are of the same density as the rest of the panel. All wall corners to be constructed with a smooth ¼" radius. The tongue and groove edges shall insure that all joints of the assembled cooler or freezer shall be air-tight and vapor-proof, secured on the interior and exterior by the foaming in place process.

The finish of the interior and exterior sides, top, back and the interior side of the front shall be 0.040 stucco patterned aluminum. The exterior of the front and the doors (both sides) shall be stainless steel. Floor sections shall be similar to all other sections. The floor sections shall be made to support a uniformly distributed load up to and including 600 lbs. per square foot. The box floor shall be 14 gauge. galvanized steel. The interior floor finish will be quarry tile, installed by the flooring contractor.

Cam-action locking devices shall be accurately and precisely positioned in the panels to assure a positive joint. The maximum distance between locking devices shall be 40". These locking devices shall consist of a cam-action rotating locking arm in the tongue edge. This locking arm shall engage a steel rod, which is firmly anchored, in the groove edge: this action will draw all tongue and groove joints firmly and tightly together. Each section of the locking device shall have sufficient surface to assure permanent and rigid anchoring, the locking device shall be bonded to the urethane form without need of additional anchorage arrangements. Both the locking arm and the steel rod shall be housed in steel pockets. The steel pockets shall flange out on each side to give additional rigidity. All locking sections shall be performed from the interior by means of hex wrench, which is furnished with the cooler and freezer. The wrench holes shall be recessed and covered with a plated plug button. The plug buttons shall be flush with the metal skin of the panel.

The doors shall be 34" wide x 79" high. Each door panel shall have steel channels vertically on each side of the door to prevent warping or racking. The door leaf shall have 3 steel channels running horizontally across the door and positioned at the latch and hinge stress points. The latch and hinges shall be fastened to the steel channels in both the door leaf and the door panel with heavy-duty, chrome-plated fasteners. Both doors shall have an anti-sweat heater to prevent condensation and frost formation. The heater shall be positioned in the edge channel of the door frame on all four sides and shall be easily accessible for replacement or service. The heater shall be covered with stainless steel. Door insulation shall be foamed in place against the steel channels. The door sections shall have a frame made of fiberglass reinforced plastic. The latch shall be heavy-duty, chrome-plated and have a solid forged metal handle. Provide doors with foot treadle openers and an interior safety release capable of opening the door from within regardless of an exterior padlock. The hinges shall be cam-action and have nylon pins with nylon bushings. A heavy-duty magnet gasket shall be mounted on the top edge and along both sides of the freezer and cooler doors. The bottom edge of the door shall contain an adjustable wiper gasket. Gaskets shall be of the push-in type that allows for easy replacement and shall be resistant to oil, fats, water, and sunlight.

Each section shall have a vapor-proof UL and NSF approved light on the interior. A light switch and neon pilot light shall be flush-mounted on the exterior near the door of each section and shall have a stainless-steel cover.

Provide a digital thermometer on the exterior, near the door of each section. The thermometer shall display the temperature of the section interior. Both units shall be completely wired and fully operational.

The refrigeration equipment will be roof mounted or mounted on a concrete pad outside the building as shown on the plans. Provide all pads, curbs and mounting materials and equipment compatible with installed roofing system – Coordinate with G.C. The freezer compartment shall have a self-contained refrigeration system for –10 degrees F. storage temperature. Provide a Copeland or equivalent air-cooled compressor unit, pre-charged, with housing and controls for roof top mounting. The cooler compartment shall have a similar compressor unit designed for +35 degrees F. storage. All refrigeration lines will be wrapped with Armaflex.

The condensing units with integral fans in each compartment will be compatible with compressors and a part of the systems. Condenser drains will be in copper tubing through the compartment wall and drip into a building floor drain. The freezer drain line will be wrapped in electric heater tape to prevent freezing of condensate in the line.

Both units shall be NSF and UL approved and shall have a flame spread rating of 25 or less, and a smoke development of 400 or less. Each section shall have a label affixed to it stating the above ratings. The freezer and cooler sections shall be warranted against defects in materials and workmanship for a period of 10 years following the date of acceptance by the Owner. Both units installed complete and started up under this contract. Provide one-year free service contract on the refrigeration system including parts, labor, and mileage. Provide an additional four-year warranty on the compressor motor.

B. ITEM NO. 3: Food Cutter
Manufacturer: Hobart
Model Number: 84186

Furnish and install cutter ready for use.

C. ITEM NO. 4: Can Opener
Manufacturer: Edlund, with ST-93
Model Number: #1

Can opener manual - Old Reliable. Install per architect's recommendation.

D. ITEM NO. 5: Not Used

E. ITEM NO. 6: Not Used

F. ITEM NO. 7: Steamer
Manufacturer: Cleveland
Model Number: 24CEA10

Low wattage two deck steamer with stand and 14 full size steam table pans.

G. ITEM NO. 8: Hot Plate
Manufacturer: Vulcan
Model Number: EV12-1HT208

H. ITEM NO. 9: Convection Oven
Manufacturer: SouthBend
Model Number: EB/20SC

I. ITEM NO. 10: Tilting Braising Pan
Manufacturer: SouthBend
Model Number: BECT-40

Dual temp., Fill Faucet (DF-60), Spray Hose, GMS-40.

J. ITEM NO. 11: Pass Thru Hot Cabinet
Manufacturer: CRES COR
Model Number: H-137-PWSUA-12D

Removable, universal pan slides, 5" casters, tempered glass door window (one side).

K. ITEM NO. 12: Pass Thru Refrigerator
Manufacturer: Victory
Model Number: RS-1D-S7-PT

Removable, universal pan slides, 5" casters, tempered glass door window (one side).

L. ITEM NO. 13: Hot Holding Cabinet
Manufacturer: CRES COR
Model Number – H-135-WSUA-11

Humidity pan.

M. ITEM NO. 14: Ice Machine
Manufacturer: Hoshizaki
Model Number: KM-515MAH

Provide one air cooled ice maker with scoop, sleeve, water and de-scaling filter. The cabinet will be constructed of corrosion resistant stainless steel and fingerprint-proof plastic.

N. ITEM NO. 14a: Ice Storage Bin
Manufacturer: Hoshizaki
Model Number: B500SF

Furnish with ice machine. Interior of storage bin to be stainless steel. 6" stainless steel legs.

O. ITEM NO. 15: Milk Cabinet (Refer to sheet A603)
Manufacturer: True
Model Number: TMC-49-DS-SS

Stainless Steel exterior. Vertical corner bumpers. 4" casters, external dial thermometer.

P. ITEM NO. 16: Hot Food Counter (Refer to sheets A603 & A604)
Manufacturer: Colorpoint
Model Number: EF5-CPA (5 wells) with sneeze guard (SS body)

Q. ITEM NO. 17: Cold Food Counter (Refer to sheets A603 & A604)
Manufacturer: Colorpoint
Model Number: 66-CFMA (4 wells) with middle shelf & sneeze guard (SS body)

R. ITEM NO. 18: Plain Top Food Table (Refer to sheets A603 & A604)
Manufacturer: Colorpoint
Model Number: 28-ST with SS shelf & 6" casters (SS Body)

S. ITEM NO. 19: Ice Cream Dispenser (Refer to sheets A603 & A604)
Manufacturer: Colorpoint
Model Number: CTAL-5 (SS Body)

Furnish and install with SS flat tray slides, lid lock and line up lock. 6" casters.

T. ITEM NO. 20: Cashier Counter (Refer to sheet A603)
Manufacturer: Colorpoint
Model Number: 28-CSE (SS Body)

U. ITEM NO. 21: Preparation Sink
Manufacturer: Custom made stainless steel
Size: 48" 1 Compartment sink and 1 side board (sink compartment shall be a minimum of 20" x 20" x 14") – with T&S B-0230-LN and T&S 065X.

Furnish and install a one (1) compartment stainless steel sink fabricated out of 14-gauge stainless steel complete, where shown on the drawings. Provide one (1) mixing faucet with 18" swing nozzle (T&S Model B230) and a 16-gauge stainless steel undershelf below the drainboard. Provide lever handle drain.

V. ITEM NO. 22: Pot Wash Sink w/Spray Assemblies
Manufacturer: Custom made stainless steel
Size: 3 Compartment sink – custom SS 20" x 30" x 14"
(1) T&S, B-0175-03, (1) T&S, B-0290

Furnish and install a three (3) compartment stainless steel pot sink fabricated out of 14-gauge stainless steel complete, where shown on the drawings. Provide one (1) mixing faucet with 18" swing nozzle (T&S B-0290) and one (1) spray assembly (T&S Model B-0175-03) and a 16-gauge stainless steel undershelf below one drainboard. The sink compartments shall be large enough to accept 18" x 26" pans laid flat (20" x 30"). The unit shall be NSF approved. Provide lever handle drain.

W. ITEM NO. 23: Preparation Sink
Manufacturer: Custom made stainless steel
Size: 96" 2 Compartment sink and 2 side boards with T&S B-0230-LN and T&S 065X.

X. ITEM NO. 24: Dishwasher
Manufacturer: Hobart
Model Number: CL44e

Y. ITEM NO. 25: Drying Shelf
Manufacturer: Custom made stainless steel
Size: 9'-0" long, custom SS

Z. ITEM NO. 26: Solid Top Food Table
Manufacturer: Colorpoint
Model Number: 84-ST (Stainless steel body)

AA. ITEM NO. 27: Work Table
Manufacture: Custom made stainless steel
Size: 30" W x 96" L x 36"H, custom SS

BB. ITEM NO. 27.1: Work Table
Manufacture: Custom made stainless steel
Size: 30" W x 48" L x 36"H, custom SS

CC. ITEM NO. 28: Utility Cart
Manufacture: Lakeside; Basis of Design
Model Number: 544 (SS - Heavy duty – 700 lb. Capacity)

DD. ITEM NO. 29: Can Rack
Manufacturer: Kelmax; Basis of Design
Model Number: CSR-156/FIFO

EE. ITEM NO. 30: Dunnage Rack
Manufacturer: Metro, MetroMax; Basis of Design
Size: 1'-0" tall – 24" wide, length varies

Furnish and install shelving units in the dry storage room, walk-in freezer and walk-in cooler. The units will be 13" high with one (1) shelf per unit with a capacity of 1300 lbs. The shelves are to be 24" wide and in standard lengths as required to conform to the configuration shown on the drawings. They shall be open grid design in polymer material, and shall be adjustable in ½" increments along the heights of the supporting posts. The posts shall have adjustable leveling feet. Each unit shall have four (4) supporting post.

FF. ITEM NO. 31: Storage Shelving
Manufacturer: Metro, MetroMax
Size: 6'-0" tall – 24" wide, length varies

GG. ITEM NO. 32: Drying Rack (Refer to sheet A603)
Manufacturer: Metro, MetroMax i
Model Number: PR48VX3

HH. ITEM NO. 33: Wire Shelving Unit
Manufacturer: Metro
Model Number: A2448NS, 24" x 48" x 60" with casters (5 tier).

II. ITEM NO. 34: Hose Reel
Manufacturer: T & S
Model Number: B-1433-04, with shroud, vacuum break and mixing valve.

JJ. ITEM NO. 35: Pre-Rinse Unit
Manufacturer: T & S
Model Number: B-0113-B, with vacuum break.

KK. ITEM NO. 36: Soiled Dish Table
Manufacturer: S.S. Custom

LL. ITEM NO. 37: Clean Dish Table
Manufacturer: S.S. Custom

MM. Kitchen Utility Distribution System (UDS)

1. Description

a. A Utility Distribution System shall provided be as indicated on drawings. Systems shall have two vertical risers, one on each end, with one dedicated to electrical and the other to plumbing. The horizontal distribution raceway between the risers shall be separated into electrical and plumbing compartments and each shall be completely enclosed and water tight with removable access panels. The risers and raceway shall be constructed of 16-gauge, type 304 stainless steel, #4 finish. A circuit protected dual convenience outlet shall be provided on each riser. Service connections shall be located behind easily removable access panels.

b. Shop drawings covering design, complete layout and installation details for the work of this section.

c. Approvals: Unit(s) shall be ETL Listed to US and Canadian Standards, ETL Sanitation Listed, AGA and MA approved.

2. General Construction and Features

a. Wireway systems:
Electrical power shall be fed through a main circuit breaker to a distribution panel which contains individual branch breakers. Each appliance is fed from the individual breakers which are wired to each receptacle located along the raceway.

b. Plumbing Riser:
The plumbing riser shall house manual (quarter-turn) shut-off valves for each incoming main supply line located in the UDS. The plumbing manifolds shall be provided with stub-outs along the raceway for the individual plumbing connections. Each stub-out shall be equipped with a manual (quarter-turn) shut-off valve.

c. Expandability:
All electrical systems are designed for additional capacity for future expansion or upgrade of connected appliances.

d. Serviceability and Accessibility:
Lift-out doors shall provide easy access to risers without moving cooking equipment, in most cases. Removable panels provided along the length of the raceway shall allow access to either plumbing or electrical compartments.

e. Electric Outlets and Cord Sets:
All outlets shall provide moisture resistant covers and have been sized per NEMA standards. Each is supplied with a matching cord and plug set if these are not already supplied by the equipment manufacturer. Twist-lock sets are standard in island applications. All 120V, single phase 15- and 20-amp receptacles are DCO-GFI.

f. Main Disconnect:
One point disconnect through a main circuit breaker equipped with a 120 VAC rated shunt trip provided in the riser.

g. Shunt Trip:
Shall be provided with each main breaker.

h. Appliance Protection:
Each electrical outlet connection shall be protected with an individual circuit breaker.

3. Electrical

The electrical system shall consist of a main circuit breaker which feeds power to a distribution panel located in the UDS containing individual branch breakers. Refer to electrical drawings in the Contract Documents for location. Each appliance is fed from the individual breakers which are wired to each receptacle located along the raceway and shall be completely isolated from the plumbing supply manifolds. The main circuit breaker shall be equipped with a built-in 120 VAC rated shunt trip and shall be located in the electrical riser requiring a single point incoming connection. Terminal block connections shall be provided for field interconnection between the shunt trip and the fire protection system for power shut-off in the event of a fire. All outlets shall be equipped with grounding type receptacles having specific NEMA polarized configurations and located on the underside or front side of the raceway at each equipment location. Outlets are matched to the cord and plug sets supplied with equipment. On island type UDS unit, all 120V, single phase 15- and 20-AMP receptacles are DCO-GFI. Twist lock cord and plug sets are provided for equipment supplied without cords. On wall mounted UDS unit, straight blade cord and plug sets are provided for equipment supplied without cords.

4. Plumbing

a. The plumbing compartment shall be completely isolated from the electrical with all piping labeled.
b. Hot and cold water and steam supply and return manifolds shall be insulated.
c. All incoming service connections shall be provided with 1/4 shut-off valve. Each branch connection shall be provided with 1/4 shut-off valve, with color coded hoses, and located at each equipment location.
d. Color coded quick disconnect hoses are provided for connection to equipment.
e. Hot and cold water piping, including branch connections, shall be type "L" copper tubing. All fittings will be copper sweat soldered (95-5 type).

Hot and Cold Water

f. Manifold: 3/4" to 1" IPS
g. 1/4 turn manual shut-off valve on manifold
h. Quick disconnect hoses: 1/4" to 1", up to 6' long
i. Quick disconnect fittings: 1/4" to 1" with 1/4 shut-off valves
j. Steam Supply/Steam Return
k. Steam Manifold: 3/4" to 3" IPS
l. Condensate Return Manifold: 3/4" to 2" IPS
m. 1/4 turn manual valves on manifolds
n. Quick disconnect hoses: 1/4" to 1-1/4", up to 6' long
o. Quick disconnect fittings: 1/4" to 1-1/4" with 1/4 shut-off valves
p. Compressed Air
q. Manifold: 1/2" to 3/4" IPS
r. 1/4 turn manual shut-off valve on manifold
s. Quick disconnect hoses: 1/4" to 1/2", up to 6' long
t. Quick disconnect fittings: 1/4" to 1/2" with 1/4 shut-off valves

5. Factory Tested

Unit(s) shall be operated, tested and set at the factory using job-site conditions for electrical and gas input. All operating and safety controls shall be tested and set at the factory.

6. Service and Parts

The supplier shall furnish gas piping schematics, as built wiring connection and control-circuit diagrams, dimension sheets and a full description of the unit(s). Service manuals showing service and maintenance requirements, shall be provided with each unit.

NN. Kitchen Hood

1. Description

a. Kitchen Exhaust Hood(s) shall be of the type UL 710 Listed for 450°F or 600°F and be provided as indicated on the Drawings. The Hood(s) shall be constructed of 304 stainless steel 16 gauge with a #4 finish. The Hood(s) shall be provided with exhaust and makeup air. The makeup air shall be a modular packaged cooling and heating unit/units. Exhaust and makeup air fan to be provided. Kitchen Hood(s) and UDS (Item NN) shall be provided by the same manufacturer. Hood(s) width shall be a minimum of 12'.

b. Hood design shall be similar to Captive Aire Model # ND-2-PSP-F6024. Acceptable manufacturers are Captive Aire, Greenheck, Avtec or approved equal.

c. All Fans (CFM's) and makeup air units (CFM's) requirements shall be designed by the manufacturer.

d. Shop Drawings covering design, complete layout and installation details for the work of this section shall be provided to the Architect as stated in these Contract Documents.

e. Approvals: The Hood(s) shall be built in compliance with NSF, NFPA #96, UL 710, ULC 710 Standards and E.T.L. Listed.

DIVISION 11

SECTION 11 66 00: ATHLETIC EQUIPMENT

11 66 00.01: GENERAL

1. Provide all labor, materials, and equipment to furnish and install the basketball backboards, gym floor plates and scoreboard.

2. Coordinate all work with other Contractors. All items are to be furnished complete and ready for use by the Owner.

11 66 00.02: PRODUCTS

1. Volleyball floor sleeves and cover shall be equal to Model No. GS-35 Floor sleeve with access cover as manufactured by AALCO Manufacturing Co., St. Louis, MO.

2. Basketball goals shall be equal to the Series 100, Center strut ceiling suspended, forward folding, height adjustable, single post backstops as manufactured by AALCO Manufacturing Co., St. Louis, MO. Goals are to fold out of the way when not in use. Folding operation of the backstops shall be provided by an electric cable winch model #75RC, remotely controlled by a wall-mounted keyed control switch, or equal. Operator shall include the following features:

   a. 115VAC, capacitor-start, overload protected motor of such HP as to raise the backstop in 2 minutes or less;
   b. Worm-gear speed reduction for unassisted support of load at all times, including the event of a power failure;
   c. 'lubed-for-life' bearing and gearing;
   d. Hoist-mounted, pre-wired rotary travel control mechanism, easily installed-set to automatically limit both up & down travel;
   e. Dual-keyed operator switch for safety.
   f. Interlock switch between operator motors of the secondary basketball goals and the bleacher assemblies such that both cannot be in the deployed position simultaneously.
   g. ¼" – 7 x 19 Aircraft cable used as lift connection.

3. The backboards for the main goals shall be 48" x 72" glass with 1/2" tempered glass set in a welded and bolted steel frame with Lexan goal mounting plates (equal to AALCO 501SUB Rectangular Glass). The side goals shall be 48" x 72" rectangular fiberglass equal to AALCO 901S Rectangular Fiberglass. The goals shall be of official size manufactured to absorb shocks and protect the backboards. Include padding at walls behind backboards for player protection as shown on the drawings.

4. Scoreboard shall be equal to basketball Model 2700 complete with controls as manufactured by NEVCO Scoreboard Company, Greenville, Illinois.

11 66 00.03: EXECUTION

1. Install all equipment in accordance with the manufacturer's specifications in a secure and smoothly operating manner.

2. All items are to be complete. Provide the Owner with all accessories required for proper operation of the equipment.

DIVISION 12

SECTION 12 21 13: WINDOW TREATMENT (HORIZONTAL BLINDS)

12 21 13.01: GENERAL

A. SCOPE

1. Furnish and install blinds in accordance with specifications, drawings, and contract documents.

2. Related work specified elsewhere.

B. QUALITY ASSURANCE

1. Installer's qualifications:

   a. The installer shall be a firm approved by manufacturer.
   b. The installer shall be qualified to install the product specified, as demonstrated by prior experience.

C. SUBMITTALS

1. Product information: Submit product literature and installation instructions.

2. Shop drawings: Indicate field-measured dimensions of opening which are to receive blinds, details on mounting surface and sill conditions, and details of corners and conditions between adjacent blinds.

3. Color samples: Submit a sample of each type and color of material specified.

D. DELIVERY, STORAGE, AND HANDLING

1. Packing and Shipping:

   a. Materials shall be delivered to the Project in original unopened packaging with labels intact.

2. Storage:

   a. Materials shall be stored in a clean area, which is free of corrosive fumes, dust, and away from construction activities.
   b. Materials shall be stacked horizontally using plastic or wood shims such that drainage and ventilation are provided for, and such that water cannot accumulate in, about or upon the containers.
   c. Stacks shall be covered with tarpaulins or plastic such that ventilation is provided for, and such that contaminants are prevented from contacting surfaces.

E. PROJECT/SITE CONDITIONS (BEFORE PRODUCT INSTALLATION BEGINS)

1. Roof must be tight, windows and frames installed and glazed, and interior doors hung.

2. Wet work including concrete, masonry, plaster, stucco, terrazzo, Sheetrock, spackling, and taping (including sanding) shall be complete and dry.

3. Ceilings, window pockets, electrical, and mechanical work above the product shall be complete.

4. Electrical power (110 volt AC) shall be available for installer's tools within 500 ft. of product installation areas.

F. WARRANTY

1. Lifetime warranty: Levolor Home Fashions shall repair or replace for the life of the blind, at its option, without charge, any part found defective in workmanship or material as long as the blind remains in the same window for which it was purchased.

12 21 13.02: PRODUCTS

A. MANUFACTURER AND PRODUCT DESCRIPTION

1. Acceptable products: Monaco DustGuard 1" (25mm) blind manufactured by Levolor Home Fashions. Lightlines Blinds manufactured by Hunter Douglas.

2. Materials:

a. Headrail shall be of .025" thick Tomized steel, "U" shaped, 1" high x 1-9/16" wide with flanged edges at top, and coated with baked-on finish. All hardware shall be enclosed in the metal headrail.
b. Guardian Tilter mechanism shall be of a not less than .042" thick Tomized steel housing with a self-lubricating nylon, automatically disengaging worm and gear mechanism to provide maximum closure, eliminate overdrive, and prevent strain or damage to blind.
c. Tilt Wand shall be transparent with a round fluted cross section approximately 5/16" in diameter with 8 grooves for nonslip grip.
d. Cord Lock shall be .031" thick Tomized steel and shall be securely attached to headrail. It shall be a crashproof type with sufficient sensitivity to lock slats at desired height upon release of cords.
e. Drum and cradle shall be provided for each ladder.

1) Drums shall be engineering polymer providing secure attachment for both ladder ends.
2) Cradles shall be of .025" thick Tomized steel having two holes with rolled edges to guide cords through bottom of headrail without abrasion. They shall provide bearing support for the tilt rod, thus preventing the weight of the blind from being transferred to the tilter. Cradles shall center drums over ladder openings.

f. Tilt Rod shall be U-shaped, with a circular radius of approximately .125" designed to achieve minimum torsional deflection.

g. End Braces shall be of at least .025" thick Tomized steel with reinforcing ribs and field adjustable tabs. End braces shall incorporate a field adjustable tab to insure secure installation, center blind in window, and prevent lateral movement.

h. Installation Brackets shall be of a least .042" thick Tomized steel with baked-on finish to match headrail. The brackets shall incorporate a rivet-hinged safety locking front cover to permit removal of headrail without lateral movement. Mounting holes shall be located to accommodate overhead, side, or face mounting.

i. Intermediate Brackets shall be supplied as required.

j. Ladders (slat supports) shall be braided polyester yarn-dyed to Levolor color standard. The two vertical components shall be .076" x .038" designed for maximum flexibility combined with minimum stretch and tensile strength of not less than 50 lbs. per cable. Horizontal components (rungs) shall consist of not less than two cables inter-braided with the vertical components. Ladder shall support the slats without visible distortion. Distance between slats shall not exceed 21.5mm (nominally 14.2 slats per vertical foot). Distance between ladders shall not exceed 23" for blinds up to 80" long. For blinds over 80" long, distance between ladders shall not be greater than 22". Distance between end ladder and end of slat shall not exceed 7".

k. Slats shall be of 5000 series magnesium aluminum alloy only, which includes recycled aluminum materials. Aluminum alloy shall be tempered to optimize tensile and yield strength for superior slat strength, resiliency, and corrosion resistance. Slats shall be nominally 1" wide and .0055"+/- .0003 (prior to coating); after coating, the thickness of the slats shall be nominally .0060". Slats shall have a coating thickness of .8 mil to 1.5 mil. Slats shall perform to 500 hours of 100% relative humidity testing, 300 hours of 5% salt spray solution at 95 degree F testing, and 250 hours of accelerated weathering testing without blistering, fading, corroding, or adhesive failure. Slat thickness and ladder support distances shall prevent visible sag or bow after continued use indoors. Bottom rail shall be of .031" thick Tomized steel formed after coating and shall be provided with color compatible molded plastic ladder and end caps having integral protrusions designed to prevent bottom bar from marring window sill and/or mullions. End caps shall provide hold-down capability designed to prevent bottom bar sway on doors or in windy exposures.

l. Lift Cord shall be braided of high strength, 1.4mm diameter polyester fiber with a high tenacity polyester core, 34 picks per inch, 16 carrier smooth braids, and shall be flexible, have minimum stretch, maximum abrasion resistance characteristics, and a minimum breaking strength of 130 lbs. Cord shall be of sufficient length equalized to properly control raising and lowering of blind and spaced not over 46" between cords.

m. Color of blind shall be selected from over 50 Levolor standard solid colors or standard metallic slat finishes and complementary standard accessory finishes. DustGuard feature is not available on all colors.

n. Options shall include:

1) Cutouts
2) Extension Plates
3) Fixed Height Lift Cord
4) Hold Down Brackets
5) Invisible Installation Brackets
6) Multiple Blinds on One Headrail
7) Pivot Plate
8) Pocket Brackets
9) Projection Brackets
10) Restrictive Cam Tilter
11) Ring Pull
12) Telescopic or Non-Telescopic Tilter Pole
13) Top-Lok Cord Lock
14) Universal Ring Tilter
15) Valance

12 21 13.03: EXECUTION

A. INSPECTION

1. Window treatment subcontractor shall be responsible for inspection of site, field measurements, and approval of mounting surfaces and installation conditions.

2. Subcontractor shall verify that site is free of conditions that interfere with blind installation and operation, and shall begin installation only when any unsatisfactory conditions have been rectified.

B. INSTALLATION

1. Installation shall comply with manufacturer specifications, standards, and procedures.

2. Provide support brackets as per manufacturer installation instructions.

3. See installation instructions packaged with blinds for more installation details.

4. Provide adequate clearance to permit unencumbered operation of blind and hardware.

5. Demonstrate blinds to be in uniform and smooth working order.

C. CLEANING

1. Clean soiled blinds with a mild soap solution only. Do not use cleaning methods involving heat, bleach, abrasives, or solvents. Do not use window cleaner or cloths with paper content.

2. Ensure proper drying following cleaning by providing adequate ventilation.

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

STUMP SOUND ELEMENTARY SCHOOL
NEW SCHOOL

ONSLOW COUNTY SCHOOLS

HOLLY RIDGE, NORTH CAROLINA

VOLUME 2

P I N N A C L E A R C H I T E C T U R E , P . A .

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for
Stump Sound Elementary School –New School
Holly Ridge, North Carolina

DIVISION 21

SECTION 21 13 00: FIRE SUPPRESSION SPRINKLERS

21 13 00.01 GENERAL

A. SCOPE

1. This specification includes the furnishing of all labor, materials, equipment and service necessary or incidental to the complete installation testing, adjusting and placing into service of the several systems of fire protection, all as shown on the drawings and as hereinafter specified. Drawings and specifications are considered as mutually explanatory and all work called for by one and not the other shall be performed as though called for by both. In cases of conflicting information, the Architect/Engineer shall be notified at once in writing. Where incidental equipment or appurtenances as required, and are not listed as shown, same shall be furnished as required for a complete fire protection system.

2. Work included in this specification shall consist of, but is not necessarily limited to, the following items:

   a. Arrange for, obtain and bear the cost of necessary permits, bonds and fees for the automatic sprinkler work.
   b. Make the connection to the existing main.
   c. Furnish and install sprinkler system to sprinkler the building where shown on the drawings. System to include all pipe, hangers, sprinkler heads, valves, controls, drains, and alarms.
   d. Furnish and install a system of standpipes complete with Fire Department valves.
   e. Furnish and install Fire Department connections located where shown on the drawings.
   f. Furnish and install all alarms, flow switches and alarm bells on the inside and outside of the building.
   g. Do the testing of all piping work and necessary cleaning of the fire protection work.
   h. Furnish the shop drawings and certificates of inspection.
   i. Periodically remove from the job site all rubbish or debris resulting from the fire protection work.
   j. Do all cutting and patching.
   k. Miscellaneous items as hereinafter specified.

B. QUALIFICATIONS OF CONTRACTORS

1. The Contractor for the Fire Protection installation shall be a qualified Fire Protection Contractor, regularly engaged in the installation of automatic fire sprinkler systems and other fire protection equipment.

C. WORK BY OTHERS

1. Electrical Contractor to wire all water flow switches and tamper switches on valves to central alarm panel. He shall also wire alarm bells.

D. STANDARDS, CODES AND REGULATIONS

1. The applicable current standards for the fire protection systems shall be NFPA 13, the North Carolina Building Code, and all other applicable state codes and ordinances.
2. The provisions of specification section 22 05 00 apply to this scope of work.

E. SUBMITTAL (SHOP) DRAWINGS AND DATA

1. Before commencing any work or providing materials at the job site for this project, the Fire Protection Contractor shall submit to the Architect, for his approval, eight copies of catalog cuts and descriptive matter regarding materials and equipment which he intends to furnish and install. Shop drawings and data shall be submitted specifically for, but not limited to, the following items:

    a. Sprinkler heads, valves, pipe, pipe hangers and couplings, hose valves and accessories, and fire department connections.

2. The Fire Protection Contractor shall prepare construction (shop) drawings for automatic sprinkler work showing the arrangement of all automatic sprinkler piping and equipment, spacing of sprinkler heads, elevations of lines and details necessary for the conduct of work. The Contractor shall submit to the Architect, for approval, four (4) "Blue Line" prints of his construction drawings which have been examined and approved by the Owners Insurance Underwriter.
3. The Fire Protection Contractor shall not proceed with the installation of the work until he has received the Architect's approval of his shop drawings.
4. The Architect's approval of shop drawings, catalog cuts, etc., shall not relieve the Fire Protection Contractor of the responsibility for any errors or omissions which may exist in the items submitted, nor shall it relieve his from responsibility for deviations for the contract drawings or specifications. The stamped approval of the shop drawings, catalog cuts, etc. shall not be construed as a complete check, but will indicate only that the general design and method of construction is satisfactory.
5. In the event additional clarifying details are required by inspection authorities, the details shall be prepared and approval of same secured by the Fire Protection Contractor at his expense.

21 13 00.02 PRODUCTS

A. GENERAL

1. All materials and equipment furnished under this Section (21 13 00) shall be new, approved by Underwriters' Laboratories, Inc. (UL), Factory Mutual (F/M), and American Water Works Association (AWWA) where applicable.

B. AUTOMATIC SPRINKLER SYSTEMS

1. Pipe shall be new, designed for 175 PSI working pressure, conforming to ASTM specifications, and have the manufacturer's name or brand, along with the appli-

cable ASTM standard, marked on each length of pipe.

2. Pipe shall be steel, Schedule 40, black, and in accordance with specifications ASTM A120 or A53 or Schedule 10, black, and in accordance with specifications ASTM A135.

3. Tubing shall be copper, Type L, suitable to withstand water working pressure not less than 175 PSI, and in accordance with specification ASTM B75 or ASTM B88.

C. FITTINGS

1. Screwed fittings shall be cast iron, 125 pound Class, black, and in accordance with ANSI B16.4 or malleable iron, 150 pound Class, black, and in accordance with ANSI B16.3.

2. Flanged fittings shall be cast iron, short body, Class 125, black, and in accordance with ANSI B16.1. Gaskets shall be full face of 1/8" minimum thickness red sheet rubber. Flange bolts shall be hexagon head machine bolts with heavy semi-flushed hexagon head nuts, cadmium plated, having dimensions in accordance with ANSI B18.2.

3. Weld fittings shall be steel standard weight, black, and in accordance with ANSI B16.9, ANSI B16.25, ASTM A234, ANSI B16.5 or ANSI B16.11.

4. Grooved couplings and mechanical fittings shall be malleable iron, 500 PSI working pressure, in accordance with ASTM A47. Coupling gasket material shall be butyl rubber. Grooved couplings shall be tested and listed by UL and/or FM. Mechanical locking fittings shall not be used.

5. Fittings for copper piping shall be wrought copper and bronze solder joint pressure fittings in accordance with ANSI B16.22 and cast bronze solder joint pressure fittings in accordance with ANSI B16.18.

D. VALVES

1. Outside screw and yoke (OS&Y) gate valves, shall be flanged, iron body, bronze mounted, 175 PSI working pressure, with handwheel turning counter-clockwise to open. Valve shall be tested and listed by UL and/or FM.

2. Check valve (ck.v.) shall be flanged, swing type, iron body, bronze seat ring and disc rings and 175 PSI pressure rating. Valve shall be tested and listed by UL and/or FM.

3. Check valve (ck.v) shall be butterfly wafer style, iron body, rubber seal, and 250 PSI pressure rating. Valve shall be tested and listed by UL and/or FM.

4. Valve for main riser drain shall be angle type or globe type, bronze body, screwed, 200 PSI pressure rating, 2" size, and a renewable composition soft disc.

5. Valve for auxiliary drain and inspector's test connection shall be globe type, bronze body, screwed, 200 PSI pressure rating, 1" size and a renewable composition soft

disc.

E. ACCESSORIES

1. At each location where called for on plans, or where required by the Fire Department, provide an approved retard-type electric flow alarm switch. Provide alarm bells as required by governing code. Flow alarm switch shall have extra set of contacts for extension by others to central alarm panel.

   a. Interior bell or horn shall be 12, 24 or 120 volt, AC or DC. Horn or bell shall be tested and listed by UL and/or FM.
   b. Exterior bell or horn shall be weatherproof 12, 24 or 120 volt, AC or DC. Horn or bell shall be tested and listed by UL and/or FM.
   c. Flow switch shall be vane type 12, 24 or 120 volt AC or DC. Flow switch shall be tested and listed by UL and/or FM.
   d. OS&Y gate valve supervisory switch shall be 12, 24 or 120 volts, AC or DC. Supervisory switch shall be tested and listed by UL and/or FM.
   e. Indicator post supervisory switch shall be weatherproof 12, 24 or 120 volt, AC or DC. Supervisory switch shall be tested and listed by UL and/or FM.

2. Sprinkler heads shall be upright, pendent, concealed, vertical sidewall, horizontal sidewall, and/or dry pendent type as required, 1/2" and/or 17/32" orifice, 1/2" and/or 3/4" pipe thread, rated 165 degrees F., 212 degrees F., and/or 286 degrees F. Sprinklers in areas with suspended ceilings shall be chrome plated with escutcheons. Sprinklers shall be tested and listed by UL and/or FM. Furnish steel enameled box housing 12 spare heads and a sprinkler wrench.

21 13 00.03 EXECUTION

A. AUTOMATIC SPRINKLER SYSTEMS

1. Schedule 40 black steel pipe shall be joined by screwed joints in accordance with specification ANSI B2.1, by welded joints in accordance with specifications ANSI B31.10, ANSI B31.1.0a and ANSI B31.1.0b, and by mechanical grooved couplings or push-on couplings, joined by a UL and FM approved combination of couplings, gaskets and grooves. Grooves may be rolled or cut and they shall be dimensionally compatible with the couplings.

2. Schedule 10 black steel ASTM A135 sprinkler pipe shall be joined by welded joints in accordance with specifications ANSI B31.1.0, ANSI couplings. Couplings may be of the rolled groove type or the mechanical locking type (push-on). Grooves for the rolled groove type shall be dimensionally compatible with the coupling. Pipe end preparation for the mechanical locking type couplings will be in according with the manufacturer's recommendations.

3. Copper tubing shall be joined by brazed joints except solder joints may be permitted for wet-pipe systems in light hazard occupancies where the temperature classification of the installed sprinklers is ordinary or intermediate. Solder joints may also be permitted for ordinary or intermediate. Solder joints may also be permitted for wet-pipe systems in ordinary hazard -Group 1 occupancies where the piping is con-

cealed. Brazing shall be done in accordance with specifications ANSI B31.1.0, ANSI B31.1.0a, and ANSI B31.1.0b. Brazing filler metal shall be classification BCUP-3 or BCUP-4 in accordance with AWS A5.8. Solder metal shall be 95-5 (tin-antimony - Grade 95 TA) in accordance with ASTM B32.

4. The interior surfaces of all piping and equipment shall be clean and free of all dirt, loose scale, rust, and other foreign material before installation.

5. Pipe ends shall be reamed to remove all burrs, and pipe sections shall be cleaned inside to remove all chips and foreign material prior to making up joints. Approved joint compound shall be applied to the threads of the pipe and not in the fitting when making up joints. Pipe shall not extend into the waterway of the fitting.

6. Sprinkler heads installed where they may be exposed or subjected to mechanical damage shall be furnished complete with head guards.

7. When welding pipe on job site, the fire hazard of the welding process shall be suitably safeguarded.

8. Pipe passing through building walls and floors above grade shall be provided with sleeves of standard weight galvanized steel pipe. The annular spaces between pipe and sleeves shall be packed tight with link seal hydrostatic pipe wall sleeve. Provide chrome plated escutcheon plates large enough to cover the pipe sleeve. Sleeves shall be sized as follows:

   a. 1" pipe - 2" ID sleeve
   b. 1-1/4" pipe - 2" ID sleeve
   c. 1-1/2" pipe - 2-1/2" ID sleeve
   d. 2" pipe - 3" ID sleeve
   e. 2-1/2" pipe - 4" ID sleeve
   f. 3" pipe - 5" ID sleeve
   g. 4" pipe - 6" ID sleeve
   h. 6" pipe - 8" ID sleeve
   i. 8" pipe - 10" ID sleeve

B. PIPE SUPPORTS

1. All piping shall be supported by means of hangers tested and listed as approved by UL and/or FM. Sizing, spacing and installation shall be in accordance with National Fire Protection Association Standard No. 13 "Sprinkler Systems", except as otherwise shown on drawings or specified herein.

2. No cutting, drilling, welding or burning of any structural steel member shall be allowed. Power driven studs and welding studs shall not be allowed.

3. All bolts and threaded rods shall be used with double nut washer, or single nut, washer and lock washer wherever a single unsecured nut could work loose and allow either threaded rod or supported piping to drop.

4. Starting length, end length and alternate lengths of main piping with grooved joint couplings shall be provided with two supports.

C. TESTS AND INSPECTION

1. The Fire Protection Contractor shall conduct and bear the costs of all necessary tests of the fire protection work, furnishing all labor power and equipment. All piping shall be tested with water, the tests witnessed by representatives of the Architect.

2. The fire protection piping shall be tested under a hydrostatic pressure of not less than 200 pounds PSIG, for a duration of not less than two (2) hours.

3. The piping subjected to the hydrostatic test shall be filled with water and thoroughly checked for the elimination of all air. The control valves of existing risers shall be closed during pressure testing of the new connection to the main. All joints shall be proven tight or acceptable by the test. Defective work or materials shall be corrected or replaced in an approved manner. If necessary, piping shall be dismantled and reassembled with the use of new pipe or fittings, as no caulking or makeshift method of temporary repair of defective work will be permitted. Tests shall be repeated until the particular line or system receives the approval of the representatives of the Architect.

4. Acceptance of the automatic sprinkler work shall be based upon the inspection and tests of the completed installation by representative of the local Fire Department and Architect.

D. WATER DAMAGE

1. The Fire Protection Contractor shall be responsible for any damage to the work of others, to building and property/materials of others caused by leaks in automatic sprinkler equipment, unplugged or disconnected pipes or fittings, and shall pay for necessary replacement or repair of work or items so damaged during the installation and testing periods of the automatic sprinkler work.

E. HYDRAULIC CALCULATIONS

1. The fire protection system is based on a combination of standpipe, sprinkler risers and sprinkler system. The Fire Protection Contractor shall prepare hydraulic calculations for the design of the system and submit for approval to the Engineer and Insurance Underwriters.

F. IDENTIFICATION SIGNS AND CHARTS

1. The drain, alarm test valves, etc., shall have standard identification signs, painted fire red with white lettering. The signs shall be attached to the valve in a conspicuous position.

DIVISION 22

SECTION 22 05 00: PLUMBING GENERAL PROVISIONS

22 05 00.01 GENERAL

A. SCOPE

1. Applicable requirements of the General Conditions, Supplementary General Conditions, and Special Conditions bound at the front of these specifications shall govern work under this heading.

2. The Contractor shall coordinate the work and equipment of this Division with the work and equipment specified elsewhere in order to assure a complete and satisfactory installation. Work such as excavation, backfill, concrete, flashing, wiring, etc., which is required by the work of this section shall be performed in accordance with the requirements of the applicable section of the specifications.

3. It is the intention of these specifications and drawings to call for finished work, tested and ready for operation. Whenever the word "provide" is used, it shall mean "furnish and install complete and ready for use".

4. Minor details not usually shown or specified, but necessary for the proper installation and operation, shall be included in the work, the same as if herein specified or shown.

5. This Contractor is referred to the General and Special Conditions of the Contract which shall form a part and be included in this section of the specification and shall be binding on this Contractor.

6. Some items of equipment are specified in the singular; however, the Contractor shall provide and install the number of items or equipment as indicated on the drawings, and as required for complete systems.

B. DEFINITION

1. The word "Contractor" as used in this section of the specification refers to the Plumbing and Fire Protection Contractor unless specifically noted otherwise. The word "provide" means furnish, fabricated, complete, install, erect, including labor and incidental materials necessary to complete in place and ready for operation or use the item referred to or described herein and/or shown or referred to on the Contract Drawings.

C. CONTRACTOR'S QUALIFICATIONS

1. It is assumed that the Contractor has had sufficient general knowledge and experience to anticipate the needs of a construction of this nature. The Contractor shall furnish all items required to complete the construction in accordance with reasonable interpretation of the intent of the Drawings and Specifications. Any minor items required by code, law or regulations shall be provided whether or not specified or specifically shown where it is a part of a major item of equipment, or of the control system specified or shown on the plans.

22 05 00.02 PRODUCTS

A. MATERIALS AND WORKMANSHIP

1. All materials and apparatus required for the work, except as specifically specified otherwise, shall be new, of first-class quality, and shall be furnished, delivered, erected, connected and finished in every detail, and shall be so selected and arranged as to fit properly into the building spaces. Where no specific kind or quality of material is given, a first-class standard article as approved by the Architect shall be furnished.

2. The Contractor shall furnish the services of an experienced superintendent, who shall be constantly in charge of the installation of the work, together with all skilled workmen, fitters, metal workers, welders, helpers and labor required to unload, transfer, erect, connect-up, adjust, start, operate and test each system.

3. Unless otherwise specifically indicated on the plans or specifications, all equipment and material shall be installed with the approval of the Architect in accordance with the recommendations of the manufacturer. This shall include the performance of such tests as the manufacturer recommends.

4. All work must be done by first-class and experienced mechanics properly supervised and it is understood that the Architect has the right to stop any work that is not being properly done and has the right to demand that any workman deemed incompetent by the Architect be removed from the job and a competent workman substituted therefore.

B. EQUIPMENT APPLICATION AND PERFORMANCE

1. The Contractor and/or Equipment Supplier shall be responsible to see that equipment supplied is correct for the intended application and will perform within the limits of capacity, noise, life expectancy, pressure drop and space limitations intended for that equipment as shown on the plans or described in the specifications. The shop drawings shall show the capacity and operating characteristics of the equipment.

C. EQUIPMENT DEVIATIONS

1. Where the Contractor proposes to use an item of equipment other than that specified or detailed on the drawings, which requires any redesign of the structure, partitions, foundations, piping, wiring or any other part of the mechanical, electrical, or architectural layout, all such redesign, and all new drawings and detailing required therefore, shall be prepared by the Subcontractor at his own expense and submitted for approval by the Architect.

2. Where such approved deviation requires a different quantity and arrangement of ductwork, piping, wiring, conduit, and equipment from that specified or indicated on the drawings, the Contractor shall furnish and install any such ductwork, piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit, and any other additional equipment required by the system, at no additional cost to the Owner.

D. MOTORS

1. Motors shall be built in accordance with the latest standards of NEMA and as specified. Motors shall be tested in accordance with standards of A.S.A. C40 and conform thereto for installation resistance and dielectric strength. Each motor shall be provided with conduit terminal box, adequate starting and protective equipment as specified or required. The capacity shall be sufficient to operate associate driven devices under all conditions of operation and load and without overload, and at least shall be the horsepower indicated or specified. Each motor shall be selected for quiet operation.

E. FOUNDATIONS, SUPPORTS, PIERS, ATTACHMENTS

1. This Contractor shall furnish and install all necessary foundations, supports, pads, bases and piers required for all equipment, piping, pumps, tanks, and for all other equipment furnished under this contract, and shall submit drawings to the Architect for approval before purchase, fabrication or construction of same.

2. For all equipment where foundations are indicated, furnish and install concrete pads minimum 4 inches thick or as shown. All pads shall be extended six (6) inches beyond machine base in all directions with top edge chamfered. Insert six (6) inch long, 1/2" round steel dowel rods at 12" on center into floors to anchor pads. Shop drawings for all foundations and pads shall be submitted to the Architect for approval before same are constructed.

3. Construction of foundations, supports, pads, bases, and piers where mounted on the floor, shall be of the same materials and same quality of finish as the adjacent and surrounding flooring material.

4. All equipment, unless otherwise shown, shall be securely attached to the building structure in an approved manner. Attachments shall be of a strong and durable nature and any attachments that are, in the opinion of the Architect, not strong enough shall be replaced as directed.

F. DIELECTRIC CONNECTIONS

1. Dielectric connections shall be used at any points within the piping systems where dissimilar metals meet. Careful attention shall be given to support brackets and hangers to select proper materials to avoid dissimilar metal contact at these points.

G. DRAINS AND VENTS

1. In addition to the drains and vents indicated on the plans and piping details, the Contractor shall install additional drains and vents as required to remove all water and air from the piping systems.

H. MOTOR STARTERS AND DISCONNECTS

1. Individual motor controllers complete with auxiliary contacts, control transformers, push buttons, selector switches and remote push button stations not specifically specified to be furnished with the equipment shall be provided under this section. Motor controllers shall comply with NEMA Standards and be complete with proper size heaters and auxiliary contacts and shall be in NEMA enclosures as required.

Unless otherwise noted, push button stations shall be oil-tight heavy duty type. Controllers shall be manual, magnetic, or combination type with disconnect switch or circuit breaker as indicated on the drawings or where required by the NEC. Controllers shall include motor over current protection in each phase conductor. Each motor controller shall be provided with phenolic nameplate, black with 1/4" high letters and white border, indicating equipment served, attached using counter sunk screws.

2. The Electrical Contractor shall furnish and install all disconnecting switches unless otherwise indicated or specified. Where disconnecting switches are indicated to be furnished under this Section, they shall be General Electric, Type TH in NEMA 1 enclosures, with voltage and amperage rating appropriate to the application. Unless otherwise noted, fuses shall be Buss "Fusetrons", or approved equal. Unfused motor disconnecting switches shall be Type TH in NEMA 1 or 4 applicable enclosures. Similar and equivalent equipment as manufactured by I.T.E., Square D, or Westinghouse is equally acceptable. Switches used as service switches shall bear such U.L. Label and nameplate on switch shall so indicate.

I. PAINTING

1. Paint material shall be selected from the products listed below and, insofar as practical, products of only one manufacturer shall be used. Contractor shall submit to the Architect the listed manufacturer he proposes to use in the work. Should the Contractor desire to use products of a manufacturer not listed below, or products made by a listed manufacturer but not scheduled herein, Contractor shall submit complete technical information on the proposed products to the Architect for approval. Only products approved by the Architect shall be used.

   a. Rust Inhibitive Primer:

      1) Devoe: Bar-Ox Quick Dry Metal Primer, Red.
      2) Duron: Deluxe Red Primer.
      3) Glidden: Rustmaster Tank and Structure Primer.
      4) Pittsburgh: Inhibitive Red Primer.

   b. Galvanized Metal Primer:

      1) Devoe: Mirrolac Galvanized Metal Primer.
      2) Duron: Duron Deluxe Galvanized Metal Primer
      3) Glidden: Rustmaster Galvanized Iron Metal Primer.
      4) Pittsburgh: Speedhigh Galvanized Steel Primer.

22 05 00.3 EXECUTION

A. DUTIES OF CONTRACTOR

1. Contractor shall furnish and install all materials called for in these Specifications and accompanying drawings, and must furnish the apparatus complete in every respect. Anything called for in the specifications and not shown on the drawings or shown on the drawings and not called for in the specifications must be furnished by the Contractor.

2. Contractor is responsible for familiarizing himself with the details of the construction of the building. Work under these specifications installed improperly or which requires changing due to improper reading or interpretation of building plans shall be corrected and changed as directed by the Architect without additional cost to the Owner.

3. The Contractor shall follow drawings in laying out work and check drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions at all points. Where headroom or space conditions appear inadequate, Architect shall be notified before proceeding with installation.

4. The plans are diagrammatic and are not intended to show each and every fitting, valve, pipe, pipe hanger, or a complete detail of all the work to be done; but are for the purpose of illustrating the type of system, showing pipe sizes, etc., and special conditions considered necessary for the experienced mechanic to take off his materials and lay out his work. This Contractor shall be responsible for taking such measurements as may be necessary at the job and adapting his work to local conditions.

5. Conditions sometimes occur which require certain changes in drawings and specifications. In the event that such changes in drawings and specifications are necessary, the same are to be made by the Contractor without expense to the Owner, providing such changes do not require furnishing more materials, or performing more labor than the true intent of the drawings and specifications demands. It is understood that while the drawings are to be followed as closely as circumstances will permit, the Contractor is held responsible for the installation of the system according to the true intent and meaning of the drawings. Anything not entirely clear in the drawings and specification will be fully explained if application is made to the Architect. Should, however, conditions arise where in the judgment of the Contractor certain changes will be advisable, the Contractor will communicate with the Architect and secure his approval of these changes before going ahead with the work.

6. The right to make any responsible change in location of apparatus, equipment, routing of piping up to the time of roughing in, is reserved by the Architect without involving any additional expense to the Owner.

7. It shall be the duty of prospective Contractors to visit the job site and familiarize themselves with job conditions. No extras will be allowed because of additional work necessitated by, or changes in plans required because of evident job conditions, that are not indicated on the drawings.

8. Contractor shall determine the schedule of work as lay down by the General Contractor and must schedule his work to maintain the building construction schedule so as not to interfere with or hold up any other Contractors.

9. Contractor shall leave the premises in a clean and orderly manner upon completion of the work, and shall remove from the premises all debris that has accumulated during the progress of the work.

B. CODES, RULES, PERMITS AND FEES

1. The Contractor shall give all necessary notices, obtain all permits and pay all sales

taxes, fees and other costs, including utility connections or extensions, in connection with his work; file all necessary plans prepare all documents and obtain all necessary approvals of all authorities having jurisdiction. Obtain all required certificates of inspection for his work and deliver same to the Architect before request for acceptance and final payment of the work.

2. The Contractor shall include in his work, without extra cost to the Owner, any labor, materials, service, apparatus, drawings, in order to comply with all applicable laws, ordinances, rules and regulations, whether or not shown on drawings and/or specified.

3. All materials furnished and all work installed shall comply with the National Fire Codes of the National Fire Protection Association, and with the requirements of all governmental departments having jurisdiction.

4. All materials and equipment for the electrical portion of the mechanical system shall bear the approval label, and shall be listed by the Underwriters' Laboratories, Inc.

5. All work shall be done in accordance with the North Carolina State Building Code, and requirements of governmental agencies having jurisdiction.

C. COOPERATION WITH OTHER TRADES

1. This Contractor shall give full cooperation to other trades and shall furnish any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.

2. Where the work of the Contractor will be installed in close proximity to, or may interfere with the work of other trades, he shall assist in working out space conditions to make a satisfactory adjustment. If so directed by the Architect, the Contractor shall prepare composite working drawings and sections at a suitable scale not less than 3/8" = 1'-0", clearly showing how his work is to be installed in relation to the work of other trades. If the Contractor installs his work before coordination with other trades, or so as to cause any interference with work of other trades, he shall make the necessary changes in his work to correct the condition without extra charge.

3. The Contractor shall furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

D. RECORD DRAWINGS

1. The Contractor shall furnish drawings showing dimensioned location and depths of all exterior piping and structures, and shall indicate any and all changes in location of piping, equipment or valves from that shown on the Contract Drawings. The drawings shall consist of clean, legible prints of the Contract Drawings, available from the Architect on which the Contractor shall mark all notes, dimensions, sizes and information required.

E. SURVEYS AND MEASUREMENTS

1. This Contractor shall base all measurements, both horizontal and vertical, from

established bench marks. All work shall agree with these established lines and levels. Verify all measurements at the site and check the correctness of same as related to the work.

2. Should the Contractor discover any discrepancy between actual measurements and those indicated, which prevents following good practice or the intent of the drawings and specifications, he shall notify the Architect through the General Contractor, and shall not proceed with his work until he has received instructions from the Architect.

F. SAFETY REQUIREMENTS

1. All systems shall be installed so as to be safe operating and all moving parts shall be covered where subject to human contact. All rough edges of equipment and materials shall be made smooth.

2. All safety controls shall be checked under the supervision of the Architect's representative and eight (8) copies of test date showing setting and performance of safety controls shall be submitted to the Architect. All pressure vessels shall be ASME stamped and shall have stamped relief valves. Water heaters shall be provided with ASME stamped T & P relief valve.

G. SHOP DRAWINGS

1. Contractor shall submit within ten (10) days after award of contract eight (8) copies of a complete list of all manufacturers to be used on the job. No substitutions will be allowed after this date except in extenuating circumstances as determined by the Architect.

2. Submission of a manufacturer's name or equipment number on this list shall not be considered as equipment approved by the Architect.

3. The Contractor shall submit for approval eight (8) sets of detailed shop drawings of all equipment and all material required to complete the project, and no materials or equipment may be delivered to the job site or installed until the Contractor has in his possession the approved shop drawings for the particular material or equipment. The shop drawings shall be complete as described herein. The Contractor shall furnish the number of copies required by the General and Special Conditions of the Contract, but in no case less than eight (8) copies.

4. Prior to delivery of any material to the job site, and sufficiently in advance of requirements to allow the Architect ample time for checking, submit for approval detailed, dimensioned drawings or cuts, showing construction, size, arrangement, operating clearances, performance, characteristics and capacity. Each item of equipment proposed shall be standard catalog product of an established manufacturer and of equal quality, finish, performance, and durability to that specified.

5. Samples, drawings, specifications, catalogs, submitted for approval, shall be properly labeled indicating specific service for which material or equipment is to be used, Section and Article number of specification governing, Contractor's Name and Name of Job.

6. Catalogs, pamphlets, or other documents submitted to describe items on which

approval is being requested, shall be specific and identification in catalog, pamphlet, etc. of item submitted shall be clearly marked. Data of a general nature will not be accepted. Data shall include eight (8) copies of computation sheets indicating how unit capacity was determined where ratings are at other than standard conditions. No payment for any equipment or labor will be allowed until all major pieces of equipment specified have been submitted to the Architect for approval.

7. The submittal of shop drawings shall be with the Contractor stamp affixed; this shall assure the Engineer that they are being submitted in accordance with Sub-Paragraph 4.13.4 in AIA Document A201 and/or Paragraph 6.26, in NSPE Document 1910-8. This stamp indicates that the Contractor, by approving and submitting shop drawings, represents that he has determined and verified all field measurements and quantities, field construction criteria, material, catalog material, and similar data that he has reviewed and coordinated information in the shop drawings with the requirements of the work and the Contract Documents. It, also, indicates that any deviation from the Contract Documents has been shown on the submittal and clearly defines the deviations from the specifications.

8. Approval rendered on shop drawings shall not be considered as a guarantee of quantities, measurements, or building conditions. Where drawings are approved, said approval does not mean that drawings have been checked in detail: said approval does not in any way relieve the Contractor from his responsibilities or necessity of furnishing material or performing work as required by the contract drawings and specifications.

9. Failure of the Contractor to submit shop drawings in ample time for checking shall not entitle him to an extension of Contract time, and no claim for extension by reason of default will be allowed.

10. All shop drawings and submittals are to be in the office of the Architect within 30 days after the Contracts have been awarded. Contractor shall be financially responsible for any price increase of shop drawing items from the time these drawings are issued until they are returned to the Contractor for purchase of items.

11. Contractor shall keep on the job at all times copies of all approved shop drawings.

H. OBSERVATION

1. The project will be observed periodically as construction progresses. The Contractor will be responsible for notifying the Architect at least 72 hours in advance when any work to be covered up is ready for inspection. No work will be covered up until after observation has been completed on such items as piping and insulation, etc.

I. ACCESSIBILITY

1. Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate clearance in double partitions and hung ceilings for the proper installation of his work. He shall cooperate with the General Contractor and all other Contractors whose work is in the same space, and shall advise the General Contractor of his requirements. Such spaces and clearances shall; however, be kept to the minimum size required.

2. The Contractor shall locate all equipment which must be serviced, operated, or

maintained in fully accessible positions. Equipment shall include but not be limited to valves, traps, cleanouts, motors, controllers, switch-gear, and drain points. If required for better accessibility, furnish access doors for this purpose. Minor deviations from drawings may be made to allow for better accessibility and any change shall be submitted for approval.

3. The Contractor shall provide the General Contractor with exact locations of access panels for each concealed valve or other device requiring service. Access panels shall be provided and installed by the General Contractor and as specified in the Architectural sections of the specifications. Locations of these panels shall be submitted in sufficient time to be installed in the normal course of work.

J. CONCEALED PIPE

1. In general, all pipes in finished spaces shall be run concealed in floors, walls, partitions and above ceilings.

2. Concealment of pipe and covering of same shall not be done until authorized by the Architect, after proper tests have been made. This applies to all interior work and exterior work.

K. CUTTING AND PATCHING

1. This Contractor shall provide all cutting and patching necessary to install the work specified in this section.

2. No structural members shall be cut without the approval of the Architect and all such cutting shall be done in a manner directed by him.

3. This Contractor shall arrange for proper openings in building to admit his equipment. If it becomes necessary to cut any portion of building to admit his equipment, portions cut must be restored to their former condition by this Contractor through agreeable arrangement with the General Contractor.

4. The General Contractor will provide all openings or chases in masonry or concrete; however, it is this Contractor's responsibility to advise exact dimensions, shape and locations of openings required in sufficient time for the General Contractor to make the necessary provisions. This Contractor shall be responsible for correct size and location of each opening for his equipment even though these openings are provided by the General Contractor.

L. SLEEVES AND PLATES

1. This Contractor shall provide and locate all sleeves and inserts required before the floors and walls are built, or shall be responsible for the cost of cutting and patching required where sleeves and inserts were not installed, or where incorrectly located. This Contractor shall do all drilling required for the installation of his hangers.

2. Sleeves shall be provided for all mechanical piping passing through concrete floor slabs and concrete, masonry, tile and gypsum wall construction. Sleeves shall not be provided for piping running imbedded in concrete or in insulating concrete slabs on grade.

3. Where sleeves are placed in exterior walls below grade, the space between the pipe or conduit and the sleeves shall be packed with oakum and lead and made completely watertight.

4. Where pipe motion due to expansion and contraction will occur, make sleeves of sufficient diameter to permit free movement of pipe. Where sleeves pass insulated pipes, the sleeves shall be large enough to pass the pipe and insulation. Check floor and wall construction finishes to determine proper length of sleeves for various locations; make actual lengths to suit the following:

   a. Terminate sleeves flush with walls, partitions and ceiling.
   b. In areas where pipes are concealed, as in chases, terminate sleeves flush with floor or as shown on the plans.
   c. In all areas where pipes are exposed, extend sleeves 1/4 inch above finished floor, except in rooms having floor drains, where sleeves shall be extended 3/4 inches above floor.

5. Sleeves shall be constructed of schedule 40 black steel pipe unless otherwise indicated on the drawings. Sleeves through concrete beams shall be constructed as indicated on the drawings.

6. Fasten sleeves securely in floor, walls, so that they will not become displaced when concrete is poured or when other construction is built around them. Take precautions to prevent concrete, plaster, or other materials being forced into the space between pipe and sleeve during construction.

7. Where piping penetrates fire rated floors or walls, penetrations shall be sealed with a U.L. approved fire stopping system. System shall be as manufactured and detailed by 3M Company or approved equal.

8. Escutcheon plates shall be provided for all exposed pipes and all exposed conduit passing through walls, floors and ceilings. Plates shall be nickel plated, of the split ring type, of size to match the pipe or conduit. Where plates are provided for pipes passing through sleeves which extend above the floor surface, provide deep recessed plates to conceal the pipe sleeves.

M. UTILITIES

1. This Contractor shall bear the cost of utilities required to perform the work under this Contract. Where services such as electricity, hoist, etc. are provided by the General Contractor, he shall be responsible directly to the General Contractor for his portion of the utilities as may be agreed upon.

N. SCAFFOLDING, RIGGING, HOISTING

1. This Contractor shall furnish all scaffolding, rigging, hoisting and services necessary for erection and delivery into the premises of any equipment and apparatus furnished. Remove same from premises when no longer required.

O. EXCAVATING AND BACKFILLING

1. Each trade shall perform all excavation and backfill required for the installation of its work.

2. Particular care shall be taken not to disturb or damage work of other Contractors.

3. Mass excavation to approximate levels will be carried out under a section of the architectural specifications. The Contractor shall, however, do all trench and pit excavation and backfilling required for work under this section of the specifications, inside and outside the building, including repairing of finished surfaces and all required shoring, bracing, pumping and all protection for safety of persons and property. State and OSHA Safety Codes shall be strictly observed. In addition, it shall be the responsibility of the Contractor to check the indicated elevations of the utilities entering and leaving the building. If such elevations require excavations lower than the footing levels, the Architect shall be notified of such conditions and a redesign shall be made before excavations are commenced. It is also the responsibility of the Contractor to make the excavations at the minimum required depths in order to avoid undercutting the footings.

4. No backfilling shall be done until work involved has been tested and approved by the Architect.

5. Contractor shall schedule excavation work so as not to unduly interfere with work of other trades on the job. Contractor shall be responsible for establishing all lines and grades required for proper location of his work.

6. When rock is encountered in excavation, it shall be paid for as outlined under the architectural section of these specifications.

7. In backfilling pipe trenches, approved fill shall first be compacted firmly and evenly on both sides of pipe in 6" layers to a depth of 12" over the top of the pipe. Remainder of trench shall be backfilled to established grade in 6" layers. Compact between each layer with a high-frequency vibrator tamper such as Dart Soil Compactor (as manufactured by Dart Manufacturing Company, Denver, Colorado). Fill shall be compacted to density specified under Earth Work Section of specifications for specified area through which trench passes. Compact fill to 95% maximum density at optimum moisture content all other areas. Earth bearing pressure as indicated shall be verified by a testing laboratory, which following the criteria specified for foundation wall trench, etc. in the Earth Work Section of the specifications. The reports shall be forwarded to the Architect for approval unless otherwise specified, the cost will be borne by this contractor, before any work is performed. If the earth bearing pressure is less than that required, the Contractor shall not begin additional work until notified by the Architect to do so. A copy of the report shall be forwarded to the Architect in triplicate.

8. Excess earth shall be distributed on premises as directed by the Architect.

9. Where ditches occur outside the building, the surface shall be finished to match existing surfaces. Any existing work or work of other trades which is damaged or disturbed shall be repaired or replaced, and left in good order.

P. ELECTRICAL CONNECTIONS

1. The Electrical Contractor shall furnish and install all wiring except interlock wiring. The Electrical Contractor shall receive from Contractor and mount all individually mounted motor starters and provide all power wiring to the motor terminals unless

otherwise indicated. The Electrical Contractor will provide branch circuit protection and disconnects unless otherwise indicated or specified. The Mechanical Contractor shall provide all other control and protective devices, and perform all control and interlock wiring required for the operation of the equipment. Power wiring, from nearest panel, for control components (dampers, panels, etc.) shall be provided by the Mechanical Contractor unless specifically called for by Division 26.

2. After all circuits are energized and complete, the Electrical Contractor shall be responsible for all power wiring, and all control wiring shall be the responsibility of this Contractor. Motors and equipment shall be provided for current characteristics as shown on the drawings.

3. It shall be the responsibility of this Contractor to check with the Electrical Contractor on service outlets provided for this Contractor, to determine that the switches and wiring provided are of adequate size to meet Code requirements for this Contractor's equipment. Any discrepancy shall be brought to the attention of the Architect before work is installed. Otherwise, any cost for changes shall be at the expense of this Contractor, and in any case electrical cost increase due to equipment substitution of different electrical characteristics shall be this Contractor's expense.

Q. PIPE WORK

1. All pipe work shown on the drawings and/or specifications or implied herein and required for a complete and operating system shall be done by experienced mechanics in a neat and workmanlike manner and subject to the approval of the Architect.

2. Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings and accessories which may be required and it shall be the responsibility of the Contractor to furnish and install all materials and equipment required for the operating systems.

3. The piping shall be installed as shown on the plans with strict conformity to the sizes listed and due provisions for expansion and contraction.

4. Unless otherwise noted on the plans, all piping shall be installed inside the insulated envelope of the building.

R. PROTECTION

1. The Contractor shall protect all work and material from damage, and shall be liable for all damage during construction.

2. The Contractor shall be responsible for work and equipment until all construction is finally inspected, tested and accepted. He shall protect work against theft, injury or damage; and shall carefully store material and equipment received on site which is not immediately installed. He shall close open ends of work including pipe or equipment with temporary covers or plugs during storage and construction to prevent entry of obstructing materials or dust and debris.

3. Provide a protective covering of not less than 0.004" thick vinyl sheeting (or a similar approved material) to be used in covering all items of equipment, immediately after the equipment has been set in place, (or if in a place of storage within the building

under construction) to prevent the accumulation of dirt, sand, cement, plaster, paint or other foreign materials from collecting on the equipment and/or fouling working parts.

S. CLEANING

1. Clean from all exposed insulation and metal surfaces grease, debris or other foreign material.

2. Chrome plated fittings, fixtures, piping and trim shall be polished upon completion.

T. VALVE, TAGS AND SCHEDULE

1. Each valve shall be provided with an engraved black finish, phenolic tag indicating service and number. Tag lettering shall be at least 1/4" high etched white letters and beveled white trim. Tags to be attached using brass chains.

2. The Contractor shall submit eight (8) copies of charts indicating valve number, location, service, "normal" position, manufacturer, size and model number to the Architect for approval.

3. Prior to final inspection an approved copy of each chart shall be framed by the Contractor in a metal frame with glass front and installed in the Equipment Room.

U. EQUIPMENT SERVICEABILITY

1. All equipment shall be serviceable. All equipment shall be installed so that it can be removed. All equipment in or connected to piping systems shall have valves to isolate this equipment from the piping system. This includes, but not necessarily limited to control valves, water heaters, sensors, switches, pumps, traps and strainers. Unions (screwed or flanged) shall be provided so that all equipment is removable.

2. Equipment installed in walls, ceilings or floors shall be accessible for service or removal without cutting walls, etc.

3. Equipment requiring periodic service shall be installed to allow clearance for service and have removable panels, access doors, etc. through which the service is to be performed.

V. ACCEPTANCE OF EQUIPMENT

1. In the event that the Architect considers it impractical, because of unsuitable test conditions, or some other factors, to execute simultaneous final acceptance of all equipment portions of the installation may be certified by the Architect for final acceptance when that portion of the system is complete and ready for operation.

2. Contractor shall make all necessary tests, trial operation balancing and balance tests, etc., as may be required as directed by the engineer to prove that all work under these plans and specification is in complete serviceable condition and will function as intended.

3. Upon completion of all work the system shall be tested to determine if any excess

noise or vibration is apparent during operation of the system. If any such objections are detected in the system or noisy equipment found, the Contractor shall be responsible for correcting same. Equipment shall be wiped clean with all traces of oil, dust, dirt and paint spots removed.

W. GUARANTEE

1. The Contractor shall guarantee the complete mechanical system a6gainst defect due to faulty materials, faulty workmanship or failure due to negligence of the Contractor. This guarantee will exclude normal wear and tear, maintenance lubrication, replacement of expendable components, or abuse. The guarantee period shall begin on the date of the final acceptance and shall continue for a period of 12 months during which time the Contractor shall make good such defective workmanship and materials and any damage resulting there from, within a reasonable time of notice given by the Owner.

X. OPERATING AND MAINTENANCE INSTRUCTIONS

1. Submit 3 sets of complete operating and maintenance instructions.

2. Bind each set in plain black vinyl-covered, hard back, 3-ring binder. Individual paper shall be Boorum and Pease Reinforced Ring Book Sheet, No. S-212-101 or equivalent.

3. Organize material in the following format:

   a. Section I:

      1) Name of Project
      2) Address
      3) Owner's Name
      4) General Contractor's Name and Address
      5) Plumbing or Fire Protection Contractor's Name and Address
      6) Warranty Dates

   b. Section II:

      1) Major Equipment List (name, manufacturer, serial no., H.P. and voltage) (include all equipment with motors)
      2) Routine Maintenance Instructions in Step-by-Step form
      3) Valve Schedules

   c. Section III:

      1) Operating and Maintenance Instructions by Manufacturer
      2) Shop Drawings (Major Requirement)

Y. PAINTING

1. Painting shall be performed as detailed in Division 9.

2. All surfaces to receive paint shall be dry and clean.

3. Before priming, all surfaces shall be thoroughly cleaned of all dirt, oil, grease, rust, scale and other foreign matter. Cleaning shall be done with sandpaper, steel scraper, or wire brush where appropriate and necessary. Metallic surfaces which have been soldered shall be cleaned with benzol and all other metal surfaces washed with benzine.

4. Mixing shall be in galvanized iron pans. Paint shall be mixed in full compliance with manufacturer's directions. Thinning shall be done only in full compliance with manufacturer's directions.

5. Workmanship shall be highest quality, free from brush marks, laps, streaks, sags, unfinished patches, or other blemishes. Edges where paint joins other material or colors shall be sharp and clean without overlapping. Paint shall be brushed or sprayed on in strict compliance with manufacturer's directions and shall work evenly and be allowed to dry at least 48 hours before subsequent coating. Paint shall not be applied in damp or rainy weather or until surface has thoroughly dried. Contractor shall furnish and lay drop-cloths in all areas where painting is done as necessary to protect work of other trades. Varnish and enamel shall not be applied when temperature in the area is less than 60 degrees Fahrenheit nor paint when under 50 degrees Fahrenheit. Prior to final acceptance, Contractor shall touch up or restore any damaged finish. All insulation materials shall be provided with a paint suitable jacket.

6. The following materials and equipment require painting as noted:

    a. All concealed piping, sheet metal, hangers and accessories except galvanized sheet metal or piping:

        1) One coat rust-inhibitive primer except where exterior insulation is provided.

    b. All exposed, exterior and interior, piping, sheet metal, hangers and accessories, except galvanized sheet metal or piping:

        1) One coat rust-inhibitive primer except where exterior insulation is provided.

    c. All concealed galvanized sheet metal, piping and accessories.

        1) One coat galvanized metal primer on threaded portions of piping and any damaged galvanized surfaces.

    d. All exposed, exterior and interior galvanized sheet metal, piping and accessories.

        1) One coat galvanized metal primer except where exterior insulation is provided.

    e. All exposed, exterior and interior, insulation equipment.

        1) Two coats exterior glass enamel over paint suitable insulation jacket.

7. All piping in Equipment Rooms shall be painted (color shown below) and identified

by stenciling with letters minimum 1/2" high in a contrasting color. Piping outside Equipment Rooms shall be stenciled. Stenciling shall occur at each change of direction and every 20 feet. Arrows should be placed adjacent to letters signifying direction of flow.

a. Standard piping color codes:

1) Hot Water - Dark Yellow (Gold)
2) Cold Water - Dark Green
3) Drains - Natural with Walls
4) Electrical - Natural with Walls

b. All exposed fire protection piping shall be painted Crimson Red, 31 YR 10/591. All concealed piping shall be labeled as noted above. Do not paint sprinkler pipe until after the pressure test has been performed and the results are acceptable to the AHJ.

DIVISION 22

SECTION 22 05 01: BASIC MATERIALS AND METHODS (PLUMBING)

22 05 01.01 GENERAL

A. DESCRIPTION

1. The provisions of Section 22 05 00 apply to all the work in this Section.

2. This section of specifications and related drawings describe requirements pertaining to basic materials and methods.

B. SUBMITTALS Submit the following in accordance with Section 22 05 00:

1. Manufacturer's cuts.

2. Certified capacity ratings.

3. Installation instructions.

4. Operating and Maintenance Instructions.

22 05 01.02 PRODUCTS

A. PIPE SPECIALTIES

1. Pipe specialty equipment shall be provided on all piping on all piping system as specified or as required by code.

2. Provide dielectric unions on the inlet and outlet connection to water heaters storage tanks and at all places where dissimilar metals join in piping and plumbing systems. Use dielectric unions as manufactured by Watts Regulator Inc., Zurn/Wilkins, Victaulic or equal.

3. Vacuum breaker shall be provided on each hose outlet. This includes hose bibbs, service sinks, wall hydrants, etc.

4. A system of pulsation absorbers shall be provided. The system shall be selected in accordance with PDI Standard W-201. Absorbers shall be by JOSAM, ZURN, SMITH or approved equal.

5. Valves and Accessories:

a. Provide valves as indicated and required as scheduled below. Figure numbers are provided to indicate type and quality. Insofar as possible, all valves shall be by a single manufacturer as specified or approved equal.

MANUFACTURER	GATES 125#	GLOBES 150#	CHECK 125#
NIBCO	T134	T235-Y	T413-B

CRANE	428-UB	7	37
STOCKHAM	B-105	B-22	B-319

6. SOLDER ENDS, SCREWED BONNET GATES, UNION BONNET GLOBES, (Globes with Teflon disc):

MANUFACTURER	GATES 125#	GLOBES 150#	CHECK 125#
NIBCO	S111	S235-Y	S413-B
CRANE	428-UB	-	1342
STOCKHAM	B-109	B-24	B-309

7. Hose end gate valves, 3/4 - 2" shall be JENKINS NO. 372, CRANE 451, POWELL 503 or approved equal.

8. Wall hydrants shall be cast brass non-freeze, heavy duty with polished chrome face, brass operating parts, adjustment locknut, renewable nylon seat, 3/4" standard hose outlet, locking cover.

9. Ball valves shall be Cast Red Bronze with Two Piece Body, full port. When installed in insulated piping furnish Extended Tee Handle. All isolation valves installed above ceilings shall be ball valves.

B. HANGERS AND SUPPORTS

1. Pipe supports shall be provided for all piping. Pipe support components shall conform to accepted standards.

   a. Hangers shall adequately support the piping system. On horizontal, hangers shall be located near or at changes in piping direction and concentrated loads. They shall provide vertical adjustment to maintain pitch required for proper drainage. They shall allow for expansion and contraction of the piping.

      1) Horizontal lines of copper tubing shall be supported as below:

Nominal Tubing Size	Rod Diameter	Maximum Spacing
Up to 1 inch	3/8 inch	6 feet
1-1/4" and 1-1/2"	3/8 inch	8 feet
2 inches	3/8 inch	9 feet
2-1/2 inches	1/2 inch	9 feet
3 and 4 inches	1/2 inch	10 feet

      2) Horizontal cast iron soil pipe shall be supported with one hanger for each pipe length and at fittings as required for proper support with hanger located close to hub or joint.

   b. Vertical Piping: When support locations are not indicated on the drawings, cast iron pipe shall be supported at every floor and cast iron soil pipe, and copper pipe at every other floor or as required to prevent vibration.

   c. Devices for attaching pipe supports to building structure shall be provided as

required and shall be as herein specified.

1) Grinnell Type CB insert shall be provided for poured-in-place concrete construction. Drilled inserts approved equal to "Phillips" self-drilling inserts shall be provided in existing concrete construction and in precast and cast-in-place concrete construction where drilled inserts are approved by the Engineer. Other type inserts, if required, are specified in the section of this Division requiring such inserts.
2) Grinnell Figure 86 malleable C - clamp with restraining clip shall be provided for attaching 2" and smaller piping to steel structure. MSS-SP-69 malleable beam clamp with extension piece shall be provided for attaching 2-1/2" and larger piping to steel structure.

d. Intermediate attachments shall be hanger rods of size herein before specified and with vibration control devices as specified in the separate section of the Division. Rods may be continuous threaded or threaded each end as required. No chain, wire or perforated strap hangers shall be used.

e. Pipe attachments and spring hangers shall be as specified in individual section of this Division of the specifications.

C. ESCUTCHEON PLATES

1. Pipes entering finished or occupied areas shall be provided with polished chrome plated escutcheon plates, held in place with set screws. Escutcheon plates shall be Grinnell Figure 20 or approved equal.

22 05 01.03 EXECUTION

A. GENERAL

1. All products shall be installed as per the manufacturer's instructions.

B. CLEANING UP

1. Cleaning up is the responsibility of the Contractor. During construction, the site shall be kept neat so as not to be a safety hazard. Upon completion of the work, all surplus construction materials and debris shall be removed from the property.

C. PIPE TEST

1. All new soil, waste, drainage and vent piping shall be tested before fixtures are installed by capping or plugging the openings, and filling the entire system with water to a minimum height of 10 feet above grade or the highest fixture opening of the section being tested, and allowing it to stand thus filled for a period of four hours.

2. All water supply piping shall be tested before fixtures or faucets are connected by capping or plugging the opening and applying a hydrostatic test pressure of 150 psig.

3. Pipe found defective during tests shall be replaced at no additional cost to the

Owner. Pipe joints found defective during tests shall be taken apart and remade.

4. The Contractor shall notify the Architect 72 hours before tests are to be made. Concealed work shall remain uncovered until specified tests are completed. All tests shall be conducted in the presence of the Architect or his representative. Repairs to defects disclosed by the test shall be made with new materials. Caulking of screwed joints, cracks or holes will not be permitted. Test shall be repeated until system is proven tight.

DIVISION 22

SECTION 22 07 00: INSULATION (PLUMBING)

22 07 00.01 GENERAL

A. DESCRIPTION

1. This section of specifications and related drawings describe requirements pertaining to insulation.

2. Provide all insulation in conjunction with equipment, piping and ductwork furnished under this division.

3. The provisions of Section 22 05 00 apply to all the work in this section.

B. QUALITY ASSURANCE

1. Products of the manufacturers listed under MATERIALS will be acceptable for use for the specific functions noted. Adhesives, sealers, vapor barriers, and coatings shall be compatible with the materials to which they are applied, and shall not corrode, soften or otherwise attack such material in either the wet or dry state.

2. Materials shall be applied subject to their temperature limits. Any methods of application of insulating materials or finishes not specified in detail herein shall be in accordance with the particular manufacturer's published recommendations.

3. Insulation shall be applied by experienced workers regularly employed for this type of work.

C. SUBMITTALS Submit the following in accordance with Section 22 05 00:

1. Catalog cuts.

2. Materials ratings.

3. Insulation instructions.

D. RATING

1. Insulation and accessories such as adhesives, mastics, cements, tape and jackets, unless noted otherwise, shall have a flame spread rating of not more than 25 and a smoke developed rating of not more than 50. Materials that are factory applied shall be tested individually. No fugitive or corrosive treatments shall be employed to impart flame resistance.

2. Flame spread and smoke developed ratings shall be determined by Method of Test of Surface Burning Characteristics of Building Materials, NFPA No. 255, ASTM E-84, UL 723.

3. Products of their shipping cartons shall bear a label indicating that flame and smoke ratings do not exceed above requirements.

4. Treatment of jackets or facings to impart flame and smoke safety shall be permanent. The use or water-soluble treatment is prohibited.

5. Certify in writing, prior to installation, that products to be used will meet RATING criteria.

22 07 00.02 PRODUCTS

A. PIPE INSULATION

1. Materials shall be heavy density fiberglass with an all-service jacket composed of an outer layer of vinyl, fiberglass scrim cloth, aluminum foil, and kraft paper, in that order, from outside to inside of pipe covering.

   a. Domestic cold water supply and hot water supply and return piping.

2. Thicknesses:

   a. Domestic cold water supply: All pipe sizes l".
   b. Domestic hot water supply and return: Pipe size 2-1/2" and larger - 1-1/2", Pipe size 2" and smaller - 1".

B. EQUIPMENT

1. Tanks and other equipment handling hot water (not factory insulated). Insulate with semi-rigid fiberglass board 1 1/2" thick. Cut to fit and cover with 8 oz. canvas jacket.

22 07 00.03 EXECUTION

A. PIPE INSULATION

1. Application:

   a. Insulation and surfaces to be insulated shall be clean and dry when insulation is installed and during the application of any finish.

2. Fiberglass Insulation:

   a. All fiberglass pipe covering shall be furnished with self-seal lap and 3" wide butt joint strips. The release paper is pulled from adhesive edge, pipe covering closed tightly around pipe and self-seal lap rubbed hard in place with the blunt edge of an insulation knife. This procedure applies to longitudinal as well as circumferential joints. Under no circumstances will staples be allowed. Care shall be taken to keep jacket clean, as it is the finish on all exposed work. All adjoining insulation sections shall be firmly butted together before butt joint strip is applied, and all cold water service lines shall have vapor seal mastic thoroughly coated to pipe at butt joints every 21' and at all fittings. All fittings, valve bodies, unions, and flanges shall be finished as follows:

      1) Apply molded or segmental insulation to fittings equal in thickness to

the insulation on adjoining pipe and wire in place with 2#14 copper wires.

2) Apply a skim coat of insulating cement to the insulated fitting, if needed, to produce a smooth surface. After cement is dry, apply Owens-Corning Fiberglass Fitting Mastic, Type C, UL labeled.

3) Wrap the fitting with fiberglass reinforcing cloth overlapping the preceding layer by 1 to 2". Also, overlap mastic and cloth by 2" on adjoining sections of pipe insulation.

4) Apply a second coat of mastic over cloth, working it well into mesh of cloth and smooth the surface. Mastic to be applied at the rate of 40 square feet per gallon. All flanges and fittings on hot and cold lines in utility tunnels shall be insulated according to above. Omit insulation on flanges and unions over 60 degrees F. If painting is required, no sizing is necessary. To maintain the non-combustibility of the system only Glidden acrylic latex paint (#5370) is to be used.

5) All piping exposed to view (equipment rooms, etc.) shall be covered with an 8 oz. canvas jacket.

DIVISION 22

SECTION 22 11 16: DOMESTIC WATER SUPPLY PIPING

22 11 16.01 GENERAL

A. SCOPE

1. The provisions of Section 22 05 00 and 22 07 00 apply to all the work in this Section.

2. Contractor shall furnish and install domestic water systems as shown on the plans complete in all respects.

3. Connect to water main and provide supply lines to all fixtures and equipment requiring water service.

B. SUBMITTALS Submit the following in accordance with Section 22 05 00:

1. Manufacturer's cuts.

22 11 16.02 PRODUCTS

A. WATER PIPING AND FITTINGS

1. Water Piping:

a. All water piping inside the building shall be hard drawn copper tubing ASTM B 88 Type "L" above grade, Type "K" below grade. Fittings for copper tubing shall be ANSI B16.18 or B16.22 solder joint fittings. Ends of pipe shall be reamed, pipe and fittings cleaned. Use only 95-5 (95% tin and 5% antimony) solder with non-corrosive flux on 1-1/4" and smaller and on 1-1/2" and larger use silver solder (Minimum 12% Silver), with a melting point greater than 1000^{o}F. Submit solder for approval.

22 11 16.03 EXECUTION

A. INSTALLATION

1. Piping shall be installed so as to be free floating. 125 pound copper sweat pattern unions shall be provided in the piping as indicated on the drawings. Provide dielectric insulating unions where copper connects to ferrous piping. Use brass nipples or copper adapters at connections to fixtures.

2. Provide isolation valves for each individual riser and toilet group as required to service system.

3. Runouts:

a. Runouts to fixtures shall be grouted in place at the fixture stop to prevent pipe movement at this point. Use concrete mortar grout. Remove insulation

from pipe before grouting.

b. Runouts to urinal and water closet flush valves in block and concrete walls shall have an 8" long piece of 1/2" copper, flattened and soldered to the runout and anchored in the wall. Runouts in stud walls shall have a piece of 1/2" copper flattened and soldered to the runout and fastened to studs with 1/4" bolts with nuts and flat washers (two bolts each end).

4. Unions:

a. Unions shall be installed at each piece of equipment.

B. STERILIZATION OF WATER PIPING

1. Sterilization of water piping shall be in accordance with AWWA Specification 0601. After the pressure tests have been made, the system shall be flushed with water. The chlorinating material shall be liquid chlorine-water mixture calcium hypochlorite, sodium hypochlorite, or chlorinated lime-water mixture. The solution shall have not less than 50 PPM available chlorine. The disinfecting solution shall be allowed to remain in the system for a minimum period of 24 hours. After disinfection, the system shall be flushed with clean water until residual chlorine content is not greater than .02 PPM. After the system is flushed, water samples shall be taken and tested at the Contractor's expense by an independent testing lab and reports shall be furnished to the engineer's for approval. If the water is found unsafe for human consumption, the disinfection procedure shall be repeated.

C. TESTING OF WATER PIPING

1. All water supply piping shall be testing before fixtures or faucets are connected by capping or plugging the openings and applying a hydrostatic test pressure of 150 psig. Pressure shall hold constant (exception for temperature variation) for a period of 24 hours or as directed by the Engineer.

DIVISION 22

SECTION 22 11 23: GAS PIPING

22 11 23.01 GENERAL

A. SCOPE

1. The provisions of Section 23 05 00 apply to all the work in this Section.

2. Contractor shall furnish and install all gas piping as shown on the plans complete in all respects.

3. Installation shall be in accordance with ALL state, local and national codes including NFPA Pamphlet No. 54 and NBFU Pamphlet No. 58.

4. The Contractor shall arrange with the operating gas company for providing gas service. The Contractor shall be responsible for seeing that the Owner is notified well in advance by letter when to make application for the gas service; a copy of the letter shall be forwarded to the Engineer.

22 11 23.02 PRODUCTS

A. GAS PIPING (ABOVE GRADE)

1. All piping shall be steel; ANSI/ASTM A53 "welded and seamless steel pipe".

B. GAS PIPING (BELOW GRADE)

1. LPG piping and fittings shall be Thermoplastic Gas Pressure Pipe in accordance with ASTM D2513-88b Appendix X2.

C. GAS PIPE FITTINGS

1. Fittings shall be steel or malleable iron. Pipe joints in pipe may be screwed or welded. Fittings shall be suitable for the appropriate working pressure.

22 11 23.03 EXECUTION

A. GAS PIPING

1. Gas piping shall be extended from the tank location as shown.

2. All gas piping shall be tested with air at 150 psig minimum. All joints shall be checked to determine if any leaks occur, using soap solution. Any joint or fitting found defective shall be removed and replaced. No caulking or other artificial means will be used to make repairs.

3. Ground plug shutoff cocks shall be installed at each equipment service stub. Piping shall be installed with valves, drip pockets, stop cocks, and other accessories that may be required to give proper service.

4. A minimum No. 18 AWG insulated copper tracer wire conductor shall be installed adjacent to underground non-metallic gas piping and shall be accessible or terminate above grade at each end.

DIVISION 22

SECTION 22 13 00: SOIL, WASTE, VENT AND DRAIN PIPING

22 13 00.01 GENERAL

A. SCOPE

1. The provisions of Section 22 05 00 apply to all the work in this Section.

2. All fixtures and equipment specified as requiring waste shall be connected to the sewer system. The sewer system shall be extended as shown on the drawings.

B. SUBMITTALS Submit the following in accordance with Section 22 05 00:

1. Manufacturer's cuts.

2. Installation instructions.

22 13 00.02 PRODUCTS

A. SOIL, WASTE, VENT AND DRAIN PIPING

1. Soil, waste, vent and drain piping shall be solid wall PVC plastic drain, waste and vent pipe and fittings conforming to ASTM D 2665.

B. WASTE ARMS

1. Waste arms serving lavatories, counter sinks and water coolers shall be threaded galvanized schedule 40 steel with schedule 40 drainage pattern fittings and adapters.

2. Waste arms serving urinals shall be standard pipe size threaded red brass pipe, with red brass threaded fittings.

C. SPECIALTIES

1. Cleanout Plugs: Cleanouts shall be of the same size as the pipe except that cleanout plugs larger than 4" will not be required. Cleanouts shall consist of long sweep fittings to an easily accessible place.

2. Traps: Each fixture and piece of equipment including floor drains and hub drains, requiring connections to the drainage system shall be equipped with a trap placed as near to the fixture as possible. No fixtures shall be double trapped. Traps for floor drains and hub drains shall be deep seal "P" traps. All other traps shall be supplied under the "Fixture Paragraph".

3. Floor Flanges: Cast iron floor flanges shall be provided for connection of all floor outlet water closets. The joint between the closet trap and the floor flange shall be made tight with a red or black rubber fixture setting gasket.

4. Flashing: Vent pipes shall be flashed and made watertight as the roof with 4 pound

sheet lead. Flashing shall extend not less than 8" from the vent pipes in all directions. Flashing shall be extended up the vent pipes and shall be turned down into the pipe. Minimum vent through the roof shall be 2" size.

5. Floor Drains: Floor drains shall be sized as indicated on the drawings. See plans for model number. Drains by Zurn, Josam, Jay R. Smith or equal will be acceptable.

22 13 00.03 EXECUTION

A. PIPE INSTALLATION

1. Horizontal drain and waste piping with the building shall be given a grade of 1/8" per foot below ground and 1/8" per foot above ceilings unless otherwise indicated on the drawings. Piping 3" and smaller shall have minimum grade of 1/4" per foot. Main vertical soil and waste stacks shall be extended full size to the roof line and 12" above as vents, unless otherwise indicated on the drawings. Fittings shall be service weight when used on service weight pipe. Reduction of the size of drainage piping in the direction of flow is prohibited. Vent or tap tees will not be permitted on waste lines.

B. JOINTS

1. Joints for PVC pipe shall be solvent cement in accordance with the manufacturer's instructions.

C. CLEANOUTS

1. Cleanouts shall be installed where shown on the drawings but in no case shall they be more than 50 feet apart in piping 3" and under and 75 feet apart in piping 4" and larger.

D. PIPE TEST

1. All new soil, waste, drainage and vent piping shall be tested before fixtures are installed by capping or plugging the openings, except for the highest opening, and filling the entire system with water. If the system is tested in sections the minimum acceptable head shall be 10 ft. of water column. In testing successive sections, at least the upper 10 ft. of the preceding section shall be tested so that no joint or pipe within the building (except the uppermost 10 ft. of the system) shall have been submitted to a test of less than 10 ft. head of water. The water column shall be allowed to stand thus filled for a period of four hours.

2. Pipe found defective during test shall be replaced at no additional cost to the Owner. Pipe joints found defective during tests shall be taken apart and remade.

DIVISION 22

SECTION 22 40 00: PLUMBING FIXTURES AND EQUIPMENT

22 40 00.01 GENERAL

A. DESCRIPTION

1. The provisions of Section 22 05 00 apply to all work in this Section.

2. The Contractor shall furnish and install all plumbing fixtures complete with all equipment, fittings, trimmings and supports as specified.

3. Products designed for dispensing potable water shall meet both the NSF 61 and NSF 372 standard.

B. SUBMITTALS Submit the following in accordance with Section 22 05 00:

1. Manufacturer's cuts.

2. Certified capacity ratings.

3. Installation instructions.

4. Operating and Maintenance Instructions.

22 40 01.02 PRODUCTS

A. FIXTURES

1. All fixtures shall be Grade "A". The name or trademark of the manufacturer shall be printed or pressed on all water closets and lavatories and a label, which cannot be removed without destroying it, containing the manufacturer's name and trademark and the quality of the fixtures, shall be affixed to all fixtures.

2. Exposed metal parts of fixtures shall be chromium plated. Where fixtures are to be hung from the wall, the fixture or fixture hanger shall be supported by concealed 3" steel washers and through bolts. Furnish traps and supply fittings with stops for all fixtures.

3. All faucets and supply fittings shall be of the same manufacturer as the fixture except as noted otherwise. All exposed supply and waste piping shall be chrome plated. Supply piping serving flush valves shall be equipped with chrome plated pipe cover.

4. Fixtures shall be white or stainless steel as indicated on drawings.

5. Direct connections between domestic water system and sanitary waste system will not be permitted.

6. All enameled cast iron fixtures shall be Acid Resisting (AR) and shall bear manufacturer's symbol signifying AR materials.

7. All flush valves shall be quiet acting, non-hold open feature and shall have sweat solder adaptor kit. Escutcheon shall be chrome plated brass with set screws.

8. Threaded adapters serving lavatory supply piping shall be concealed in walls. Runouts to fixture shall be chrome plated brass pipe.

9. All exposed waste piping serving fixtures, except service sinks, shall be 17 gauge chrome plated brass pipe with cast brass P-trap. Under Counters will be considered exposed areas.

10. Cut-Off Stops: All fixtures shall have individual loose key cut-off stops on cold and/or hot water lines except as specified hereinafter or indicated on the drawings.

11. Provide appropriate wall hangers for all wall-hung fixtures.

B. ELECTRIC WATER HEATER

1. Type. The water heaters shall be electric with automatic controls and approved by Underwriters' Laboratories, Inc. and approved by the National Sanitation Foundation.

2. Capacity. The storage capacity and recovery capacity shall be shown on the drawings.

3. Tank. Tank shall be heavy gauge steel with inner lining of glass. Tank shall have insulation completely around tank, top and bottom. There shall be a hose thread drain valve at bottom of tank and any pipe nipples used in water connections shall have interior surface to match interior surface of tank. Dielectric unions shall be used to connect glass coated galvanized pipe nipples to cover water pipe. Unit shall be constructed in accordance with ASME Code Section VIII and shall bear the appropriate symbol and be listed with the National Board as required.

4. Jacket. The water heater shall have a jacket of cold rolled steel with white baked on enamel finish. Jacket shall have provisions for access to all controls and heating elements.

5. Relief Valve. The heater shall be equipped with an ASME approved T & P relief valve pipe to drain.

6. Control compartment shall be hinged and shall house 120 volt control circuit transformer, transformer fusing, magnetic contactor(s), immersion style operating thermostat(s), element fusing per N.E.C. and medium watt density commercial grade INCO-LOY sheathed flange mounted elements with prewired leads. Include manual reset high temperature unit switch.

7. Electric Heating Element. Shall be copper sheathed immersion type element and shall be installed with thermostat hot water trap, and cold water inlet baffle.

8. Mounting. The electric water heater shall be set dead level in both directions.

9. Piping Connections. The electric water heater shall have piping connections as shown on the drawings.

10. Cleaning. The electric water heater shall be cleaned and all construction dirt removed at the completion of the project.

11. Insulation shall meet requirements of latest ASHRAE Standard.

22 40 00.03 EXECUTION

A. GENERAL

1. Install all fixtures as per manufacturer's requirements and local codes.

B. CAULKING

1. Fixtures, fittings and accessories shall be caulked at floor and wall perimeter and behind flanges and fittings in a fashion that the wall openings are sealed, but no sealant is exposed.

2. Caulking shall be silicone rubber.

3. Install all caulking per manufacturer’s instructions.

C. MANUFACTURERS START-UP

1. For each gas water heater, start-up service shall be provided through the manufacturer’s representative and shall include the burner equipment and controls.

DIVISION 23

SECTION 23 05 00: MECHANICAL GENERAL PROVISIONS

23 05 00.01: GENERAL

A. SCOPE

1. Applicable requirements of the General Conditions, Supplementary General Conditions, and Special Conditions bound at the front of these specifications shall govern work under this heading.

2. The Contractor shall coordinate the work and equipment of this Division with the work and equipment specified elsewhere in order to assure a complete and satisfactory installation. Work such as excavation, backfill, concrete, flashing, wiring, etc., which is required by the work of this section shall be performed in accordance with the requirements of the applicable section of the specifications.

3. It is the intention of these specifications and drawings to call for finished work, tested and ready for operation. Whenever the word "provide" is used, it shall mean "furnish and install complete and ready for use".

4. Minor details not usually shown or specified, but necessary for the proper installation and operation, shall be included in the work, the same as if herein specified or shown.

5. This Contractor is referred to the General and Special Conditions of the Contract which shall form a part and be included in this section of the specification and shall be binding on this Contractor.

6. Some items of equipment are specified in the singular; however, the Contractor shall provide and install the number of items or equipment as indicated on the drawings, and as required for complete systems.

B. DEFINITION

1. The word "Contractor" as used in this section of the specification refers to the HVAC Contractor unless specifically noted otherwise. The word "provide" means furnish, fabricated, complete, install, erect, including labor and incidental materials necessary to complete in place and ready for operation or use the item referred to or described herein and/or shown or referred to on the Contract Drawings.

C. CONTRACTOR'S QUALIFICATIONS

1. It is assumed that the Contractor has had sufficient general knowledge and experience to anticipate the needs of a construction of this nature. The Contractor shall furnish all items required to complete the construction in accordance with reasonable interpretation of the intent of the Drawings and Specifications. Any minor items required by code, law or regulations shall be provided whether or not specified or specifically shown where it is a part of a major item of equipment, or of the control system specified or shown on the plans.

23 05 00.02: PRODUCTS

A. MATERIALS AND WORKMANSHIP

1. All materials and apparatus required for the work, except as specifically specified otherwise, shall be new, of first-class quality, and shall be furnished, delivered, erected, connected and finished in every detail, and shall be so selected and arranged as to fit properly into the building spaces. Where no specific kind or quality of material is given, a first-class standard article as approved by the Architect shall be furnished.

2. The Contractor shall furnish the services of an experienced superintendent, who shall be constantly in charge of the installation of the work, together with all skilled workmen, fitters, metal workers, welders, helpers and labor required to unload, transfer, erect, connect-up, adjust, start, operate and test each system.

3. Unless otherwise specifically indicated on the plans or specifications, all equipment and material shall be installed with the approval of the Architect in accordance with the recommendations of the manufacturer. This shall include the performance of such tests as the manufacturer recommends.

4. All work must be done by first-class and experienced mechanics properly supervised and it is understood that the Architect has the right to stop any work that is not being properly done and has the right to demand that any workman deemed incompetent by the Architect be removed from the job and a competent workman substituted therefore.

B. EQUIPMENT APPLICATION AND PERFORMANCE

1. The Contractor and/or Equipment Supplier shall be responsible to see that equipment supplied is correct for the intended application and will perform within the limits of capacity, noise, life expectancy, pressure drop and space limitations intended for that equipment as shown on the plans or described in the specifications. The shop drawings shall show the capacity and operating characteristics of the equipment.

C. EQUIPMENT DEVIATIONS

1. Where the Contractor proposes to use an item of equipment other than that specified or detailed on the drawings, which requires any redesign of the structure, partitions, foundations, piping, wiring or any other part of the mechanical, electrical, or architectural layout, all such redesign, and all new drawings and detailing required therefore, shall be prepared by the Subcontractor at his own expense and submitted for approval by the Architect.

2. Where such approved deviation requires a different quantity and arrangement of ductwork, piping, wiring, conduit, and equipment from that specified or indicated on the drawings, the Contractor shall furnish and install any such ductwork, piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit, and any other additional equipment required by the system, at no additional cost to the Owner.

D. MOTORS

1. Motors shall be built in accordance with the latest standards of NEMA and as specified. Motors shall be tested in accordance with standards of A.S.A. C40 and conform thereto for installation resistance and dielectric strength. Each motor shall be provided with conduit terminal box, adequate starting and protective equipment as specified or required. The capacity shall be sufficient to operate associate driven devices under all conditions of operation and load and without overload, and at least shall be the horsepower indicated or specified. Each motor shall be selected for quiet operation. Motors shall have a minimum acceptable nominal full load efficiency as required by ASHRAE 90.1.

E. DRIVES

1. Machinery drives shall be provided for all power driven equipment specified in this section.

2. Drives shall be V-belt and shall be selected to overcome the starting inertia of the equipment without slippage, but in no case shall be less than 150% of the full motor load. Drives 1/2 HP and smaller may be provided with single belts. Drives 3/4 HP and larger shall be provided with the number of belts necessary to transmit the required power with 95% minimum efficiency.

3. Where adjustable type sheaves are indicated they shall be selected such that the schedule speed of the driven equipment is at the midpoint in the adjustment range of the sheave.

4. Where fixed type sheaves are indicated the Contractor shall include in his price changing sheave sizes once during the balancing period to achieve proper air quantities.

5. Sheaves shall be machined cast iron of the same manufacturer as the belt provided. Shop drawings shall be submitted of each drive which shall include actual transmission capacity of each drive.

F. FOUNDATIONS, SUPPORTS, PIERS, ATTACHMENTS

1. This Contractor shall furnish and install all necessary foundations, supports, pads, bases and piers required for all air conditioning equipment, piping, pumps, tanks, compressors, and for all other equipment furnished under this contract, and shall submit drawings to the Architect for approval before purchase, fabrication or construction of same.

2. For all equipment where foundations are indicated, furnish and install concrete pads minimum 4 inches thick or as shown. All pads shall be extended six (6) inches beyond machine base in all directions with top edge hampered. Insert six (6) inch long, 1/2" round steel dowel rods at 12" on center into floors to anchor pads. Shop drawings for all foundations and pads shall be submitted to the Architect for approval before same are constructed.

3. Construction of foundations, supports, pads, bases, and piers where mounted on the floor, shall be of the same materials and same quality of finish as the adjacent and surrounding flooring material.

4. All equipment, unless otherwise shown, shall be securely attached to the building structure in an approved manner. Attachments shall be of a strong and durable nature and any attachments that are, in the opinion of the Architect, not strong enough shall be replaced as directed.

G. VIBRATION ISOLATION

1. All work shall operate under all conditions of loads without any sound or vibration which is objectionable in the opinion of the Architect. If requested, the Contractor shall record sound power level readings in all areas adjacent to mechanical rooms, over, under or beside, after all equipment is fully operational and all wall and ceiling systems are completed. Sound level readings shall not exceed NC levels as recommended in Table 34, Chapter 46 of 1999 ASHRAE Applications Handbook.

2. The readings are to be tabulated in the Maintenance and Operating Instruction Booklets.

3. Sound or vibration conditions in excess of listed quantities shall be corrected in an approved manner by the Contractor at his expense.

4. Unless otherwise noted mechanical equipment over one horsepower shall be isolated from the structure with resilient vibration and noise isolators supplied by one manufacturer to the Mechanical Contractor. Where isolator type and required deflection are not shown, equipment shall be isolated in accordance with the 1999 ASHRAE Applications Handbook, Chapter 46, Table 45. Submittals shall include complete design for the equipment bases, a tabulation of the design data for the isolators, including lateral stiffness, O.D.; free operating and solid height of the spring isolators, free and operating height of the neoprene or fiberglass isolators. Selection of isolators for proper loading to obtain desired efficiency shall be the responsibility of the manufacturer of isolating units to suit the equipment being supplied on the job and shall be fully guaranteed by this supplier. All vibration isolation equipment complete with thorough selection data shall be submitted. Units shall be Vibration Eliminator Company, Mason, Peabody, or approved equal.

5. Flexible duct connections shall be provided at inlet and outlet of all fans or cabinets containing fans and shall be constructed such as to allow a minimum movement of 2 inches in any direction and will not restrict normal movement of any equipment.

H. DIELECTRIC CONNECTIONS

1. Dielectric connections shall be used at any points within the piping systems where dissimilar metals meet. Careful attention shall be given to support brackets and hangers to select proper materials to avoid dissimilar metal contact at these points.

I. DRAINS AND VENTS

1. In addition to the drains and vents indicated on the plans and piping details, the Contractor shall install additional drains and vents as required to remove all water and air from the piping systems.

J. MOTOR STARTERS AND DISCONNECTS

1. Individual motor controllers complete with auxiliary contacts, control transformers,

push buttons, selector switches and remote push button stations not specifically specified to be furnished with the equipment shall be provided under this section. Motor controllers shall comply with NEMA Standards and be complete with proper size heaters and auxiliary contacts and shall be in NEMA enclosures as required. Unless otherwise noted, push button stations shall be oil-tight heavy duty type. Controllers shall be manual, magnetic, or combination type with disconnect switch or circuit breaker as indicated on the drawings or where required by the NEC. Controllers shall include motor over current protection in each phase conductor. Each motor controller shall be provided with phenolic nameplate, black with 1/4" high letters and white border, indicating equipment served, attached using counter sunk screws.

2. The Electrical Contractor shall furnish and install all disconnecting switches unless otherwise indicated or specified. Where disconnecting switches are indicated to befurnished under this Section, they shall be General Electric, Type TH in NEMA 1 enclosures, with voltage and amperage rating appropriate to the application. Unless otherwise noted, fuses shall be Buss "Fusetrons", or approved equal. Unfused motor disconnecting switches shall be Type TH in NEMA 1 or 4 applicable enclosures.Similar and equivalent equipment as manufactured by I.T.E., Square D, or Westinghouse is equally acceptable. Switches used as service switches shall bear such U.L. Label and nameplate on switch shall so indicate.

K. PAINTING

1. Paint material shall be selected from the products listed below and, insofar as practical, products of only one manufacturer shall be used. Contractor shall submitto the Architect the listed manufacturer he proposes to use in the work. Should the Contractor desire to use products of a manufacturer not listed below, or products made by a listed manufacturer but not scheduled herein, Contractor shall submit complete technical information on the proposed products to the Architect for approval. Only products approved by the Architect shall be used.

   a. Rust Inhibitive Primer:

      1) Devoe: Bar-Ox Quick Dry Metal Primer, Red.
      2) Duron: Deluxe Red Primer.
      3) Glidden: Rustmaster Tank and Structure Primer.
      4) Pittsburgh: Inhibitive Red Primer.

   b. Galvanized Metal Primer:

      1) Devoe: Mirrolac Galvanized Metal Primer.
      2) Duron: Duron Deluxe Galvanized Metal Primer
      3) Glidden: Rustmaster Galvanized Iron Metal Primer.
      4) Pittsburgh: Speedhigh Galvanized Steel Primer.

23 05 00.03: EXECUTION

A. DUTIES OF CONTRACTOR

1. Contractor shall furnish and install all materials called for in these Specifications and accompanying drawings, and must furnish the apparatus complete in every respect.

Anything called for in the specifications and not shown on the drawings or shown on the drawings and not called for in the specifications must be furnished by the Contractor.

2. Contractor is responsible for familiarizing himself with the details of the construction of the building. Work under these specifications installed improperly or which requires changing due to improper reading or interpretation of building plans shall be corrected and changed as directed by the Architect without additional cost to the Owner.

3. The Contractor shall follow drawings in laying out work and check drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions at all points. Where headroom or space conditions appear inadequate, Architect shall be notified before proceeding with installation.

4. The plans are diagrammatic and are not intended to show each and every fitting, valve, pipe, pipe hanger, or a complete detail of all the work to be done; but are for the purpose of illustrating the type of system, showing pipe sizes, etc., and special conditions considered necessary for the experienced mechanic to take off his materials and lay out his work. This Contractor shall be responsible for taking such measurements as may be necessary at the job and adapting his work to local conditions.

5. Conditions sometimes occur which require certain changes in drawings and specifications. In the event that such changes in drawings and specifications are necessary, the same are to be made by the Contractor without expense to the Owner, providing such changes do not require furnishing more materials, or performing more labor than the true intent of the drawings and specifications demands. It is understood that while the drawings are to be followed as closely as circumstances will permit, the Contractor is held responsible for the installation of the system according to the true intent and meaning of the drawings. Anything not entirely clear in the drawings and specification will be fully explained if application is made to the Architect. Should, however, conditions arise where in the judgment of the Contractor certain changes will be advisable, the Contractor will communicate with the Architect and secure his approval of these changes before going ahead with the work.

6. The right to make any responsible change in location of apparatus, equipment, routing of piping up to the time of roughing in, is reserved by the Architect without involving any additional expense to the Owner.

7. It shall be the duty of prospective Contractors to visit the job site and familiarize themselves with job conditions. No extras will be allowed because of additional work necessitated by, or changes in plans required because of evident job conditions, that are not indicated on the drawings.

8. Contractor shall determine the schedule of work as lay down by the General Contractor and must schedule his work to maintain the building construction schedule so as not to interfere with or hold up any other Contractors.

9. Contractor shall leave the premises in a clean and orderly manner upon completion of the work, and shall remove from the premises all debris that has accumulated during the progress of the work.

B. CODES, RULES, PERMITS AND FEES

1. The Contractor shall give all necessary notices, obtain all permits and pay all sales taxes, fees and other costs, including utility connections or extensions, in connection with his work; file all necessary plans prepare all documents and obtain all necessary approvals of all authorities having jurisdiction. Obtain all required certificates of inspection for his work and deliver same to the Architect before request for acceptance and final payment of the work.

2. The Contractor shall include in his work, without extra cost to the Owner, any labor, materials, service, apparatus, drawings, in order to comply with all applicable laws, ordinances, rules and regulations, whether or not shown on drawings and/or specified.

3. All materials furnished and all work installed shall comply with the National Fire Codes of the National Fire Protection Association, and with the requirements of all governmental departments having jurisdiction.

4. All materials and equipment for the electrical portion of the mechanical system shall bear the approval label, and shall be listed by the Underwriters' Laboratories, Inc.

5. All work shall be done in accordance with the North Carolina Building Code and requirements of governmental agencies having jurisdiction.

C. COOPERATION WITH OTHER TRADES

1. This Contractor shall give full cooperation to other trades and shall furnish any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.

2. If so directed by the Architect, the Contractor shall prepare composite working drawings and sections at a suitable scale not less than 3/8" = 1'-0", clearly showing how his work is to be installed in relation to the work of other trades. If the Contractor installs his work before coordination with other trades, or so as to cause any interference with work of other trades, he shall make the necessary changes in his work to correct the condition without extra charge.

3. The Contractor shall furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

D. RECORD DRAWINGS

1. The Contractor shall furnish drawings showing dimensioned location and depths of all exterior piping and structures, and shall indicate any and all changes in location of piping, ductwork, equipment or valves from that shown on the Contract Drawings. The drawings shall consist of clean, legible sepia prints of the Contract Drawings, available from the Architect on which the Contractor shall mark all notes, dimensions, sizes and information required. The sepias shall be kept for this purpose only. Before final inspection the Contractor shall submit to the Architect eight (8) sets of black line prints of the sepias.

E. SURVEYS AND MEASUREMENTS

1. This Contractor shall base all measurements, both horizontal and vertical, from established bench marks. All work shall agree with these established lines and levels. Verify all measurements at the site and check the correctness of same as related to the work.

2. Should the Contractor discover any discrepancy between actual measurements and those indicated, which prevents following good practice or the intent of the drawings and specifications, he shall notify the Architect through the General Contractor, and shall not proceed with his work until he has received instructions from the Architect.

F. SAFETY REQUIREMENTS

1. All systems shall be installed so as to be safe operating and all moving parts shall be covered where subject to human contact. All rough edges of equipment and materials shall be made smooth.

2. All safety controls shall be checked under the supervision of the Architect's representative and eight (8) copies of test date showing setting and performance of safety controls shall be submitted to the Architect.

G. SHOP DRAWINGS

1. Contractor shall submit within ten (10) days after award of contract eight (8) copies of a complete list of all manufacturers to be used on the job. No substitutions will be allowed after this date except in extenuating circumstances as determined by the Architect.

2. Submission of a manufacturer's name or equipment number on this list shall not be considered as equipment approved by the Architect.

3. The Contractor shall submit for approval eight (8) sets of detailed shop drawings of all equipment and all material required to complete the project, and no materials or equipment may be delivered to the job site or installed until the Contractor has in his possession the approved shop drawings for the particular material or equipment. The shop drawings shall be complete as described herein. The Contractor shall furnish the number of copies required by the General and Special Conditions of the Contract, but in no case less than eight (8) copies.

4. Prior to delivery of any material to the job site, and sufficiently in advance of requirements to allow the Architect ample time for checking, submit for approval detailed, dimensioned drawings or cuts, showing construction, size, arrangement, operating clearances, performance, characteristics and capacity. Each item of equipment proposed shall be standard catalog product of an established manufacturer and of equal quality, finish, performance, and durability to that specified.

5. Samples, drawings, specifications, catalogs, submitted for approval, shall be properly labeled indicating specific service for which material or equipment is to be used, Section and Article number of specification governing, Contractor's Name and Name of Job.

6. Catalogs, pamphlets, or other documents submitted to describe items on which approval is being requested, shall be specific and identification in catalog, pamphlet, etc. of item submitted shall be clearly marked. Data of a general nature will not be accepted. Data shall include eight (8) copies of computation sheets indicating how unit capacity was determined where ratings are at other than standard conditions. No payment for any equipment or labor will be allowed until all major pieces of equipment specified have been submitted to the Architect for approval.

7. The Contractor, as part of the shop drawing submitted, shall submit shop drawing of all ductwork in the mechanical rooms, the risers including takeoffs to the floors with their associated dampers, and ells with unequal legs showing turning vanes.

8. Static pressure drops across fittings, dampers, heaters, attenuators, etc. shall not exceed minimum ASHRAE Standards when not specified.

9. The submittal of shop drawings shall be with the Contractor stamp affixed; this shall assure the Engineer that they are being submitted in accordance with Sub-Paragraph 4.13.4 in AIA Document A201 and/or Paragraph 6.26, in NSPE Document 1910-8. This stamp indicates that the Contractor, by approving and submitting shop drawings, represents that he has determined and verified all field measurements and quantities, field construction criteria, material, catalog material, and similar data that he has reviewed and coordinated information in the shop drawings with the requirements of the work and the Contract Documents. It also, indicates that any deviation from the Contract Documents has been shown on the submittal and clearly defines the deviations from the specifications.

10. Approval rendered on shop drawings shall not be considered as a guarantee of quantities, measurements, or building conditions. Where drawings are approved, said approval does not mean that drawings have been checked in detail: said approval does not in any way relieve the Contractor from his responsibilities or necessity of furnishing material or performing work as required by the contract drawings and specifications.

11. Failure of the Contractor to submit shop drawings in ample time for checking shall not entitle him to an extension of Contract time, and no claim for extension by reason of default will be allowed.

12. All shop drawings and submittals are to be in the office of the Architect within 30 days after the Contracts have been awarded. Contractor shall be financially responsible for any price increase of shop drawing items from the time these drawings are issued until they are returned to the Contractor for purchase of items.

13. Contractor shall keep on the job at all times copies of all approved shop drawings.

H. OBSERVATION

1. The project will be observed periodically as construction progresses. The Contractor will be responsible for notifying the Architect at least 72 hours in advance when any work to be covered up is ready for inspection. No work will be covered up until after observation has been completed on such items as piping and insulation, etc.

I. ACCESSIBILITY

1. Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate clearance in double partitions and hung ceilings for the proper installation of his work. He shall cooperate with the General Contractor and all other Contractors whose work is in the same space, and shall advise the General Contractor of his requirements. Such spaces and clearances shall; however, be kept to the minimum size required.

2. The Contractor shall locate all equipment which must be serviced, operated, or maintained in fully accessible positions. Equipment shall include but not be limited to traps, cleanouts, motors, controllers, switch-gear, and drain points. If required for better accessibility, furnish access doors for this purpose. Minor deviations from drawings may be made to allow for better accessibility and any change shall be submitted for approval.

3. The Contractor shall provide the General Contractor with exact locations of access panels for each concealed control damper or other device requiring service. Access panels shall be provided and installed by the General Contractor and as specified in the Architectural sections of the specifications. Locations of these panels shall be submitted in sufficient time to be installed in the normal course of work.

J. CONCEALED PIPE

1. In general, all pipes in finished spaces shall be run concealed in floors, walls, partitions and above ceilings.

2. Concealment of pipe and covering of same shall not be done until authorized by the Architect, after proper tests have been made. This applies to all interior work and exterior work.

K. CUTTING AND PATCHING

1. This Contractor shall provide all cutting and patching necessary to install the work specified in this section.

2. No structural members shall be cut without the approval of the Architect and all such cutting shall be done in a manner directed by him.

3. This Contractor shall arrange for proper openings in building to admit his equipment. If it becomes necessary to cut any portion of building to admit his equipment, portions cut must be restored to their former condition by this Contractor through agreeable arrangement with the General Contractor.

4. The General Contractor will provide all openings or chases in masonry or concrete; however, it is this Contractor's responsibility to advise exact dimensions, shape and locations of openings required in sufficient time for the General Contractor to make the necessary provisions. This Contractor shall be responsible for correct size and location of each opening for his equipment even though these openings are provided by the General Contractor.

L. SLEEVES AND PLATES

1. This Contractor shall provide and locate all sleeves and inserts required before the floors and walls are built, or shall be responsible for the cost of cutting and patching

required where sleeves and inserts were not installed, or where incorrectly located. This Contractor shall do all drilling required for the installation of his hangers.

2. Sleeves shall be provided for all mechanical piping passing through concrete floor slabs and concrete, masonry, tile and gypsum wall construction. Sleeves shall not be provided for piping running imbedded in concrete or in insulating concrete slabs on grade.

3. Where sleeves are placed in exterior walls below grade, the space between the pipe or conduit and the sleeves shall be packed with oakum and lead and made completely watertight.

4. Where pipe motion due to expansion and contraction will occur, make sleeves of sufficient diameter to permit free movement of pipe. Where sleeves pass insulated pipes, the sleeves shall be large enough to pass the pipe and insulation. Check floor and wall construction finishes to determine proper length of sleeves for various locations; make actual lengths to suit the following:

   a. Terminate sleeves flush with walls, partitions and ceiling.
   b. In areas where pipes are concealed, as in chases, terminate sleeves flush with floor or as shown on the plans.
   c. In all areas where pipes are exposed, extend sleeves 1/4 inch above finished floor, except in rooms having floor drains, where sleeves shall be extended ¾ inches above floor.

5. Sleeves shall be constructed of schedule 40 black steel pipe unless otherwise indicated on the drawings. Sleeves through concrete beams shall be constructed as indicated on the drawings.

6. Fasten sleeves securely in floor, walls, so that they will not become displaced when concrete is poured or when other construction is built around them. Take precautions to prevent concrete, plaster, or other materials being forced into the space between pipe and sleeve during construction.

7. Where piping penetrates fire rated floors or walls, penetrations shall be sealed with a U.L. approved fire stopping system. System shall be as manufactured and detailed by 3M Company or approved equal.

8. Escutcheon plates shall be provided for all exposed pipes and all exposed conduit passing through walls, floors and ceilings. Plates shall be nickel plated, of the split ring type, of size to match the pipe or conduit. Where plates are provided for pipes passing through sleeves which extend above the floor surface, provide deep recessed plates to conceal the pipe sleeves.

M. UTILITIES

1. This Contractor shall bear the cost of utilities required to perform the work under this Contract. Where services such as electricity, hoist, etc. are provided by the General Contractor, he shall be responsible directly to the General Contractor for his portion of the utilities as may be agreed upon.

N. SCAFFOLDING, RIGGING, HOISTING

1. This Contractor shall furnish all scaffolding, rigging, hoisting and services necessary for erection and delivery into the premises of any equipment and apparatus furnished. Remove same from premises when no longer required.

O. ELECTRICAL CONNECTIONS

1. The Electrical Contractor shall furnish and install all wiring except: (1) temperature control wiring; (2) equipment control wiring and (3) interlock wiring. The Electrical Contractor shall receive from the Mechanical Contractor and mount all individually mounted motor starters and provide all power wiring to the motor terminals unless otherwise indicated. The Electrical Contractor will provide branch circuit protection and disconnects unless otherwise indicated or specified. The Mechanical Contractor shall provide all other control and protective devices, and perform all control and interlock wiring required for the operation of the equipment. Power wiring, from nearest panel, for control components (dampers, panels, etc.) shall be provided by the Mechanical Contractor unless specifically called for by Division 26.

2. After all circuits are energized and complete, the Electrical Contractor shall be responsible for all power wiring, and all control wiring shall be the responsibility of this Contractor. Motors and equipment shall be provided for current characteristics as shown on the drawings.

3. It shall be the responsibility of this Contractor to check with the Electrical Contractor on service outlets provided for this Contractor, to determine that the switches and wiring provided are of adequate size to meet Code requirements for this Contractor's equipment. Any discrepancy shall be brought to the attention of the Architect before work is installed. Otherwise, any cost for changes shall be at the expense of this Contractor, and in any case electrical cost increase due to equipment substitution of different electrical characteristics shall be this Contractor's expense.

P. PIPE WORK

1. All pipe work shown on the drawings and/or specifications or implied herein and required for a complete and operating system shall be done by experienced mechanics in a neat and workmanlike manner and subject to the approval of the Architect.

2. Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings and accessories which may be required and it shall be the responsibility of the Contractor to furnish and install all materials and equipment required for the operating systems.

3. The piping shall be installed as shown on the plans with strict conformity to the sizes listed and due provisions for expansion and contraction.

4. Unless otherwise noted on the plans, all piping shall be installed inside the insulated envelope of the building.

Q. LUBRICATION

1. All bearing, except those specifically requiring oil lubrication, shall be pressure lubricated. All lubrication points shall be readily accessible, away from locations dangerous to workmen. In areas where lubrication points are not readily accessible

Contractor shall provide extended lubrication tubes to positions where lubrication can be easily accomplished. Pressure grease lubrication fittings shall be "Zerk-Hydraulic" type as made by the Stewart-Warner Corporation, or approved equal, for each type of grease required.

2. The Contractor shall furnish lubrication charts or schedules for each piece of equipment or machinery. The charts or schedules shall designate each point of lubrication. Eight (8) copies of charts and schedules shall be submitted to the Architect prior to final inspection and approved copies of each schedule and chart shall be framed by the Contractor in metal frames with glass front and installed in the Equipment Room.

R. PROTECTION

1. The Contractor shall protect all work and material from damage, and shall be liable for all damage during construction.

2. The Contractor shall be responsible for work and equipment until all construction is finally inspected, tested and accepted. He shall protect work against theft, injury or damage; and shall carefully store material and equipment received on site which is not immediately installed. He shall close open ends of work including pipe, duct, or equipment with temporary covers or plugs during storage and construction to prevent entry of obstructing materials or dust and debris.

3. Provide a protective covering of not less than 0.004" thick vinyl sheeting (or a similar approved material) to be used in covering all items of equipment, immediately after the equipment has been set in place, (or if in a place of storage within the building under construction) to prevent the accumulation of dirt, sand, cement, plaster, paint or other foreign materials from collecting on the equipment and/or fouling working parts.

S. CLEANING

1. Clean from all exposed insulation and metal surfaces grease, debris or other foreign material.

2. Chrome plated fittings, fixtures, piping and trim shall be polished upon completion.

T. LABELS AND INSTRUCTIONS

1. Label all switches and controls furnished under this Section with engraved bakelite permanent labels to indicate the function of each and the apparatus serviced.

2. Post in the Equipment Room framed under glass the following:

   a. Lubrication instructions listing all equipment which requires lubrication, the type of lubricant to be used and the frequency of lubrication.

3. All units shall be marked with unit numbers in three inch high letters with unit designated numbers.

4. A tabulation shall be made of each panel number and circuit number serving each air conditioning unit, fan or other device with electrical service. This list shall be

prepared and be ready to turn over to inspectors prior to calling for final inspection.

U. MOTOR & DAMPER TAGS AND SCHEDULE

1. Each motor and damper shall be provided with an engraved black finish, phenolic tag indicating service and number. Tag lettering shall be at least 1/4" high etched white letters and beveled white trim. Tags to be attached using brass chains.

2. The Contractor shall submit eight (8) copies of charts indicating number, location, service, "normal" position, manufacturer, size and model number to the Architect for approval.

3. Prior to final inspection an approved copy of each chart shall be framed by the Contractor in a metal frame with glass front and installed in the Equipment Room.

V. EQUIPMENT SERVICEABILITY

1. All equipment shall be serviceable. All equipment shall be installed so that it can be removed. All equipment in or connected to piping systems shall have valves to isolate this equipment from the piping system. This includes, but not necessarily limited to control valves, sensors and switches. Unions (screwed or flanged) shall be provided so that all equipment is removable.

2. Equipment installed in walls, ceilings or floors shall be accessible for service or removal without cutting walls, etc.

3. Equipment requiring periodic service shall be installed to allow clearance for service and have removable panels, access doors, etc. through which the service is to be performed.

W. ACCEPTANCE OF EQUIPMENT

1. In the event that the Architect considers it impractical, because of unsuitable test conditions, or some other factors, to execute simultaneous final acceptance of all equipment portions of the installation may be certified by the Architect for final acceptance when that portion of the system is complete and ready for operation.

2. Contractor shall make all necessary tests, trial operation balancing and balance tests, etc., as may be required as directed by the engineer to prove that all work under these plans and specification is in complete serviceable condition and will function as intended.

3. Upon completion of all work the system shall be tested to determine if any excess noise or vibration is apparent during operation of the system. If any such objections are detected in the system or noisy equipment found, the Contractor shall be responsible for correcting same. Ducts, plenums and casings shall be cleaned of all debris and blown free of all particles of rubbish and dust before installing outlet faces. Equipment shall be wiped clean with all traces of oil, dust, dirt and paint spots removed. Temporary filters shall be provided for all fans that are operated during construction and after all construction dirt has been removed from the building, new filters shall be installed. Bearings shall be lubricated as recommended by the equipment manufacturer. Fans shall be adjusted to the speed indicated by the manufacturer to meet specified conditions.

X. GUARANTEE

1. The Contractor shall guarantee the complete mechanical system against defect due to faulty materials, faulty workmanship or failure due to negligence of the Contractor. This guarantee will exclude normal wear and tear, maintenance lubrication, replacement of expendable components, or abuse. The guarantee period shall begin on the date of the final acceptance and shall continue for a period of 12 months during which time the Contractor shall make good such defective workmanship and materials and any damage resulting there from, within a reasonable time of notice given by the Owner.

2. Refrigeration compressors shall have a five (5) year warranty.

Y. OPERATING AND MAINTENANCE INSTRUCTIONS

1. Submit 3 sets of complete operating and maintenance instructions.

2. Bind each set in plain black vinyl-covered, hard back, 3-ring binder. Individual paper shall be Boorum and Pease Reinforced Ring Book Sheet, No. S-212-101 or equivalent.

3. Organize material in the following format:

   a. Section I:

      1) Name of Project
      2) Address
      3) Owner's Name
      4) General Contractor's Name and Address
      5) Mechanical Contractor's Name and Address
      6) Warranty Dates

   b. Section II:

      1) Major Equipment List (name, manufacturer, serial no., H.P. and voltage) (include all equipment with motors)
      2) Control Sequence Description (Mechanical Only)
      3) Routine Maintenance Instructions in Step-by-Step form
      4) Lubrication Charts and Schedules
      5) Test and Balance Reports (Mechanical Only)
      6) Sound Power Level Readings (Where Required)

   c. Section III:

      1) Operating and Maintenance Instructions by Manufacturer
      2) Shop Drawings (Major Requirement)
      3) Wiring Diagrams
      4) Control Drawings (Mechanical Only)

Z. PAINTING

1. Painting shall be performed as detailed in Division 9.

2. All surfaces to receive paint shall be dry and clean.

3. Before priming, all surfaces shall be thoroughly cleaned of all dirt, oil, grease, rust, scale and other foreign matter. Cleaning shall be done with sandpaper, steel scraper, or wire brush where appropriate and necessary. Metallic surfaces which have been soldered shall be cleaned with benzol and all other metal surfaces washed with benzine.

4. Mixing shall be in galvanized iron pans. Paint shall be mixed in full compliance with manufacturer's directions. Thinning shall be done only in full compliance with manufacturer's directions.

5. Workmanship shall be highest quality, free from brush marks, laps, streaks, sags, unfinished patches, or other blemishes. Edges where paint joins other material or colors shall be sharp and clean without overlapping. Paint shall be brushed or sprayed on in strict compliance with manufacturer's directions and shall work evenly and be allowed to dry at least 48 hours before subsequent coating. Paint shall not be applied in damp or rainy weather or until surface has thoroughly dried. Contractor shall furnish and lay drop-cloths in all areas where painting is done as necessary to protect work of other trades. Varnish and enamel shall not be applied when temperature in the area is less than 60 degrees Fahrenheit nor paint when under 50 degrees Fahrenheit. Prior to final acceptance, Contractor shall touch up or restore any damaged finish. All insulation materials shall be provided with a paint suitable jacket.

6. The following materials and equipment require painting as noted:

    a. All concealed piping, sheet metal, hangers and accessories except galvanized sheet metal or piping:

        1) One coat rust-inhibitive primer except where exterior insulation is provided.

    b. All exposed, exterior and interior, piping, sheet metal, hangers and accessories, air handling units, pumps, etc. except galvanized sheet metal or piping:

        1) One coat rust-inhibitive primer except where exterior insulation is provided.

    c. All concealed galvanized sheet metal, piping and accessories.

        1) One coat galvanized metal primer on threaded portions of piping and an damaged galvanized surfaces.

    d. All exposed, exterior and interior galvanized sheet metal, piping and accessories.

        1) One coat galvanized metal primer except where exterior insulation is provided.

    e. All exposed, exterior and interior, insulation equipment.

1) Two coats exterior glass enamel over paint suitable insulation jacket.

7. All piping in Equipment Rooms shall be painted (color shown below) and identified by stenciling with letters minimum 1/2" high in a contrasting color. Piping outside Equipment Rooms shall be stenciled. Stenciling shall occur at each change of direction and every 20 feet. Arrows should be placed adjacent to letters signifying direction of flow.

a. Standard piping color codes:

1) Drains - Natural with Walls
2) Electrical - Natural with Walls

DIVISION 23

SECTION 23 05 93: TESTING, ADJUSTING, AND BALANCING

23 05 93.01 GENERAL

A. SCOPE

1. The provisions of Section 23 05 00 apply to all the work in this Section.

2. Work shall be performed by technicians shall be competent in the trade of testing and balancing environmental systems and shall be done in an organized manner utilizing appropriate test and balance forms.

3. The test and balance report shall be submitted prior to the final inspection. The TAB sub-contractor shall attend the final to spot check air and water flows.

B. SUBMITTALS. Submit the following in accordance with Section 23 05 00:

1. Manufacturer's cut sheets for all equipment to be used.

2. Sample balancing charts and forms.

3. Completed final balancing data.

23 05 93.02 PRODUCTS

A. INSTRUMENTATION

1. Instruments for use in the test and balancing procedures shall be of first quality and be accurately calibrated at the time of use. The following list is provided to indicate the instruments expected, however, other instruments as necessary to properly perform the work will be provided and subject to approval of the Architect.

   a. Inclined manometer calibrated in no less that .006-inch divisions.
   b. Combination inclined and vertical manometer (0 to 10 inch is generally the most useful).
   c. Pitot Tubes. (Usually and 18 and 48 inch tube covers most balance requirements.
   d. Tachometer. This instrument should be of the high quality self-timing type.
   e. Clamp-on ampere meter with voltage scales.
   f. Deflecting vane anemometer.
   g. Rotating vane anemometer.
   h. Thermal type (hot wire) anemometer.
   i. Hook gage.
   j. Dial and glass stem thermometers.
   k. Sling psychrometer.

2. The accuracy of calibration of the field instruments used is of the utmost importance. All field instruments used in the balance should have been calibrated at least within the previous three months. Naturally, any suspect instruments should be checked more frequently.

23 05 93.03 EXECUTION

A. SYSTEM START-UP

1. Starting date for mechanical system shall be scheduled well in advance of expected completion date and shall be established a minimum of two weeks prior to acceptance date. The system shall be in full operation with all equipment functional prior to acceptance date.

2. Performance readings shall be taken and recorded on all air distribution devices and the system shall be balanced out prior to acceptance. System shall be balanced to +10%/-5% of specified values. Balancing of the system shall be accomplished with duct dampers and only minor adjustments made with grille dampers. Record and submit results in table form along side of scheduled quantities.

3. All controls shall be calibrated by qualified personnel prior to acceptance date. Thermostats shall be in close calibration with one another and shall operate their respective units without interference from adjacent units.

4. All units shall be checked out thoroughly and the information recorded on each machine. Check sheets shall be included in Operating and Maintenance instructional Manual.

5. Replace fan sheaves as necessary to produce design air volume.

DIVISION 23

SECTION 23 07 00: INSULATION (MECHANICAL)

23 07 00.01 GENERAL

A. DESCRIPTION

1. This section of specifications and related drawings describe requirements pertaining to insulation.

2. Provide all insulation in conjunction with equipment, piping and ductwork furnished under this division.

3. The provisions of Section 23 05 00 apply to all the work in this section.

B. QUALITY ASSURANCE

1. Products of the manufacturers listed under MATERIALS will be acceptable for use for the specific functions noted. Adhesives, sealers, vapor barriers, and coatings shall be compatible with the materials to which they are applied, and shall not corrode, soften or otherwise attack such material in either the wet or dry state.

2. Materials shall be applied subject to their temperature limits. Any methods of application of insulating materials or finishes not specified in detail herein shall be in accordance with the particular manufacturer's published recommendations.

3. Insulation shall be applied by experienced workers regularly employed for this type of work.

C. SUBMITTALS. Submit the following in accordance with Section 23 05 00:

1. Catalog cuts.

2. Materials ratings.

3. Insulation instructions.

D. RATING

1. Insulation and accessories such as adhesives, mastics, cements, tape and jackets, unless noted otherwise, shall have a flame spread rating of not more than 25 and a smoke developed rating of not more than 50. Materials that are factory applied shall be tested individually. No fugitive or corrosive treatments shall be employed to impart flame resistance.

2. Flame spread and smoke developed ratings shall be determined by Method of Test of Surface Burning Characteristics of Building Materials, NFPA No. 255, ASTM E-84, UL 723.

3. Products of their shipping cartons shall bear a label indicating that flame and smoke ratings do not exceed above requirements.

4. Treatment of jackets or facings to impart flame and smoke safety shall be permanent. The use or water-soluble treatment is prohibited.

5 Certify in writing, prior to installation, that products to be used will meet RATING criteria.

23 07 00.02 PRODUCTS

A. PIPE INSULATION

1. Materials shall be heavy density fiberglass with an all-service jacket composed of an outer layer of vinyl, fiberglass scrim cloth, aluminum foil, and kraft paper, in that order, from outside to inside of pipe covering.

   a. Condensate drain lines.
   b. Refrigerant Suction Piping - flexible foamed elastomeric plastic tubing with a density of 6 lbs./CF, K of 0.27 @ 70 degrees F., self-extinguishing, and a water vapor transmission of less than 0.05 perm in., flame spread rating 25 or less, smoke developed rating of 50 or less (ASTM E84-75).

2. Thicknesses:

   a. Condensate drain lines: 1".

B. DUCT INSULATION

1. Materials. Insulation shall be Owens-Corning as specified hereinafter or products of Certain-Teed/St. Gobain or Manville. Adhesives shall be as manufactured by 3-M Foster or Insulation Manufacturer. Insulation shall have composite (insulation, jacket and adhesive) fire and smoke hazard rating as tested by ASTM E-84, not exceeding Flame Spread -25 and Smoke Developed -50.

23 07 00.03 EXECUTION

A. PIPE INSULATION

1. Application:

   a. Insulation and surfaces to be insulated shall be clean and dry when insulation is installed and during the application of any finish.

2. Refrigerant Piping.

   a. End joint strips and overlap seams shall be adhered with a vapor barrier mastic. Valves, fittings, and flanges shall be insulated with strips of pipe insulation, and finished with tape and vapor barrier mastic. Seal off vapor barrier to pipe at all fittings, hangers, and every 20 feet on straight runs.

3. Fiberglass Insulation:

   a. All fiberglass pipe covering shall be furnished with self-seal lap and 3" wide

butt joint strips. The release paper is pulled from adhesive edge, pipe covering closed tightly around pipe and self-seal lap rubbed hard in place with the blunt edge of an insulation knife. This procedure applies to longitudinal as well as circumferential joints. Under no circumstances will staples be allowed. Care shall be taken to keep jacket clean, as it is the finish on all exposed work. All adjoining insulation sections shall be firmly butted together before butt joint strip is applied, and all cold water service lines shall have vapor seal mastic thoroughly coated to pipe at butt joints every 21' and at all fittings. All fittings, valve bodies, unions, and flanges shall be finished as follows:

1) Apply molded or segmental insulation to fittings equal in thickness to the insulation on adjoining pipe and wire in place with 2#14 copper wires.
2) Apply a skim coat of insulating cement to the insulated fitting, if needed, to produce a smooth surface. After cement is dry, apply Owens-Corning Fiberglass Fitting Mastic, Type C, UL labeled.
3) Wrap the fitting with fiberglass reinforcing cloth overlapping the preceding layer by 1 to 2". Also, overlap mastic and cloth by 2" on adjoining sections of pipe insulation.
4) Apply a second coat of mastic over cloth, working it well into mesh of cloth and smooth the surface. Mastic to be applied at the rate of 40 square feet per gallon. All flanges and fittings on hot and cold lines in utility tunnels shall be insulated according to above. Omit insulation on flanges and unions over 60 degrees F. If painting is required, no sizing is necessary. To maintain the non-combustibility of the system only Glidden acrylic latex paint (#5370) is to be used.
5) All piping exposed to view (equipment rooms, etc.) shall be covered with an 8 oz. canvas jacket.

B. DUCT INSULATION

1. All vapor barriers and joints shall be sealed to prevent condensation. Clean and dry all ductwork before installing insulation. All weld joints shall be wire brushed and give one (1) coat of red lead before insulating. Staples will not be permitted in insulation.

2. Lined Duct:

a. Where noted on plans, ductwork shall be lined with Owens-Corning Aeroflex Vapor-Seal Duct Insulation, 1 ½ pcf, 1" thick, or equal by Certain-Teed/St. Gobain or Johns Mansville.
b. Duct liner and adhesive shall meet requirements of NFPA 90A and shall have UL fire hazard classification not to exceed the following: flame spread -25; fuel contributed -50; smoke generated -50. There will be no erosion of duct liner material at velocities up to 4000 fpm. Duct liner shall be applied to the sheet metal with 100% coverage of adhesive. The duct liner shall be cut to assure corner joints with no gaps. On horizontal runs, tops of ducts over 12" in width and sides of 16" in height shall be additionally secured with mechanical fasteners. On spans less than 30" fasteners are to be placed at midpoints. On vertical runs, fasteners shall be placed on a maximum of 15" centers on all width dimensions over 12". Fasteners shall be flush with the liner surface. All exposed edges and leading edges of all transverse and

longitudinal joints of the liner shall be coated with a fire resistant adhesive. The exposed mechanical fasteners shall be coated with a fire resistant adhesive. The upstream end must be continuously adhered to for a 6" width.

3. Wrapped Duct:

a. All supply and outside air duct unless noted otherwise on plans or in specifications shall be insulated by wrapping with 2" thick, ¾ lb. density, fiberglass with vapor barrier jacket with joints overlapped a minimum of two inches. Insulation shall be adhered to duct with non-combustible insulation bonding adhesive applied in 4" strips, 8" on center. All joints shall be secured with flare door staples on 3" centers through all laps over duct tape.

DIVISION 23

SECTION 23 09 00: BUILDING AUTOMATION SYSTEM

23 09 00.01 GENERAL

A. RELATED DOCUMENTS

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

B. RELATED SECTIONS

1. This Section includes the Building Management System (BMS) control equipment for HVAC systems and components, including open protocol control components for split system heat pumps, energy recovery units and vertical self-contained heat pumps.

2. Additional related sections and sub-sections can apply.

    a. 23 05 00 Mechanical General Provisions

C. STANDARD TERMS

1. Standard

    a. ASHRAE: American Society Heating, Refrigeration, Air Conditioning Engineers
    b. BACnet: Building Automation Controls Network
    c. BMS: Building Management System
    d. DDC: Direct Digital Control
    e. EIA: Electronic Industries Alliance
    f. GUI: Graphical User Interface
    g. HVAC: Heating, Ventilation, and Air Conditioning
    h. IEEE: Institute Electrical Electronic Engineers
    i. MER: Mechanical Equipment Room
    j. PID: Proportional, Integral, Derivative

2. Communications and protocols

    a. ARP: Address Resolution Protocol
    b. CORBA: Common Object Request Broker Architecture
    c. CSMA/CD: Carrier Sense Multiple Access/Collision Detect
    d. DDE: Dynamic Data Exchange
    e. FTT: Free Topology Transceivers
    f. HTTP: Hyper Text Transfer Protocol

g. IIOP: Internet Inter-ORB Protocol
h. LAN: Local Area Network
i. LON: Echelon Communication – Local Operating Network
j. MS/TP: Master Slave Token Passing
k. ODBC: Open Database Connectivity
l. ORB: Object Request Broker
m. SNVT: Standard Network Variables Types
n. SQL: Structured Query Language
o. UDP: User Datagram Protocol
p. XML: eXtensible Markup Language

3. Controllers

a. ASD: Application Specific Device
b. AAC: Advanced Application Controller
c. ASC: Application Specific Controller.
d. CAC: Custom Application Controller.
e. DCU: Distributed Control Unit
f. LCM: Local Control Module
g. MC: MicroControllers
h. MCI: MicroInterface
i. MN-II: Microzone II direct digital controller
j. MN-FLO: Micronet 2000 Pressure Independent VAV Controller
k. NSC: Network Server Controller
l. PEM: Package Equipment Module
m. PPC: Programmable Process Controller
n. SDCU: Standalone Digital Control Units
o. SLC: Supervisory Logic Controller
p. UEC: Unitary Equipment Controller

4. Tools and Software

a. AMBCx: Automated Monitoring Based Commissioning
b. APEO: Automated Predictive Energy Optimization
c. DR: Demand Response
d. CCDT: Configuration, Commissioning and Diagnostic Tool
e. BPES: BACnet Portable Engineering Station
f. LPES: LON Portable Engineering Station
g. POT: Portable Operator's Terminal

D. QUALIFICATIONS OF BIDDER AND PRE-BID SUBMITTAL

1. All bidders must be building automation contractors in the business of installing direct digital control building automation systems for a minimum of 10 years.

2. The Building Management System contractor shall have a full service facility within 200 miles of the project that is staffed with engineers trained and certified by the manufacturer in the configuration, programming and service of the automation system. The contractor's technicians shall be fully capable of providing instructions and routine emergency maintenance service on all system components.

    a. Any installing contractor, not listed as prequalified in the Approved Manufacturer's section, shall submit credentials as detailed in the Pre-bid Submittal section for the engineer's review 2 weeks prior to bid date. Failure to follow the attached formats shall disqualify potential alternate bidders. Credentials must attest that the contractor meets all requirements of the specification and the Engineers judgment regarding approval to bid as an acceptable installer after reviewing the data will be final.

3. All bidders must be authorized distributors or branch offices of the manufacturers specified.

4. The following bidders have been pre-qualified:

    a. Schneider Electric

5. Any installing contractors or manufacturers interested in participating as acceptable bidders for this project that are not pre-qualified shall furnish a detailed technical pre-bid submittal to the consulting engineer. All information must be submitted 2 weeks prior to the published bid date to allow the engineer adequate time to review the bidder's credentials.

6. The Pre-Bid submittal shall contain the following information as a minimum:

    a. A profile of the manufacturer and the local installation and service/organization.
    b. Description of how the system meets and achieves all the specified criteria in terms of configuration, operation, and control.
    c. System Architecture with single line riser diagram showing all major components (digital controllers, routers, hubs, etc.) that will be required for this project.
    d. Procedure for commissioning and time required to startup and commission each of the systems for this project.
    e. Contractors approach for the project planning and management.
    f. Product Data Sheets for all components, DDC panels, and all accessories listed per the appropriate specification sections herein.
    g. Examples of actual graphic screens for other similar projects.
    h. Number and types of DDC panels required for this installation.
    i. Number and types of spare points provided with the proposed system.
    j. Recommended spare parts list for components with list price schedule.
    k. List of 2 similar systems in size, point capacity, total installed value, installed and commissioned by the local office with a list of the installers/manufacturers design team members for each project and the owners contact information.

l. Samples of service offerings and a list of current similar service contracts with contact information.

m. Resumes for the management team and all employees who will be involved with the project design, commissioning, project management, and after installation service. Resumes should include copies of manufacturer's certifications for the proposed product line.

n. Copy of this Control Specification in its entirety with a check mark beside each paragraph to signify that the manufacturer's equipment and software shall fully conform to the specified requirement. If the requirement cannot be met, indicate the reasons/limitations and the alternative proposed.

o. An interview may be conducted and the bidder will be requested to make a formal presentation concerning the proposed system and possibly provide an installed project tour prior to a final decision.

E. SCOPE OF WORK

1. The Contractor shall furnish and install a complete building automation system including all necessary hardware and all operating and applications software necessary to perform the control sequences of operation as called for in this specification. All components of the system – workstations, servers, application controllers, unitary controllers, etc. shall communicate using the BACnet protocol, as defined by ASHRAE Standard 135-2007, or EIA standard 709.1, the LonTalk™ protocol, or Modbus protocol. The only exception will be field controllers within the Schneider I/NET, Continuum, and NETWORK 8000 family. No gateways shall be used for communication to controllers furnished under this section.

2. Except as otherwise noted, the control system shall consist of all necessary Ethernet Network Controllers, Standalone Digital Control Units, workstations, software, sensors, transducers, relays, valves, dampers, damper operators, control panels, and other accessory equipment, along with a complete system of electrical interlocking wiring to fill the intent of the specification and provide for a complete and operable system.

3. The BAS contractor shall review and study all HVAC drawings and the entire specification to familiarize themselves with the equipment and system operation and to verify the quantities and types of dampers, operators, alarms, etc. to be provided.

4. All interlocking wiring, wiring and installation of control devices associated with the equipment listed below shall be provided under this Contract. When the BAS system is fully installed and operational, the BAS Contractor and representatives of the Owner will review and check out the system – see System Acceptance and Testing section of this document. At that time, the BAS contractor shall demonstrate the operation of the system and prove that it complies with the intent of the drawings and specifications.

5. Provide services and manpower necessary for check out and testing of the system in coordination with the HVAC Contractor, Balancing Contractor and Owner's representative.

6. All work performed under this section of the specifications will comply with all governing codes, laws and governing bodies. If the drawings and/or specifications are in conflict with governing codes, the Contractor, with guidance from the engineer, shall submit a proposal with appropriate modifications to the project to meet code restrictions. If this specification and associated drawings exceed governing code requirements, the specification will govern. The Contractor shall obtain and pay for all necessary construction permits and licenses.

F. SYSTEM DESCRIPTION

1. In accordance to the scope of work, the system shall also provide a graphical, web-based, operator interface that allows for instant access to any system through a standard browser. The contractor must provide PC-based programming workstations, operator workstations and microcomputer controllers of modular design providing distributed processing capability, and allowing future expansion of both input/output points and processing/control functions.

2. For this project, the system shall consist of the following components:

   a. Administration and Programming Workstation(s): Unless already existing on the customer site, the BAS Contractor shall furnish (qty) Administration and Programming Workstation Computers as described in Part 2 of the specification. These workstations must be running the standard workstation software developed and tested by the manufacturer of the network server controllers and the standalone controllers. No third party front-end workstation software will be acceptable. Workstations must conform to the B-OWS BACnet device profile.
   b. Web-Based Operator Workstations: The BAS Contractor shall furnish licenses for web connection to the BAS system. Web-based users shall have access to all system points and graphics, shall be able to receive and acknowledge alarms, and shall be able to control setpoints and other parameters. All engineering work, such as trends, reports, graphics, etc. that are accomplished from the WorkStation shall be available for viewing through the web browser interface without additional changes. The web-based interface must conform to the B-OWS BACnet device profile. There will be no need for any additional computer based hardware to support the web-based user interface.
   c. Ethernet-based Network Router and/or Network Server Controller(s): The BAS Contractor shall furnish Ethernet-based Network Server Controllers as described in Part 2 of the specification. These controllers will connect directly to the Operator Workstation over Ethernet at a minimum of 100mbps, and provide communication to the Standalone Digital Control Units and/or other Input/Output Modules. Network Server Controllers shall conform to BACnet device profile B-BC. Network controllers that utilize RS232 serial communications or ARCNET to communicate with the workstations will not be accepted.
   d. Network Controllers shall be tested and certified by the BACnet Testing Laboratory (BTL) as Network Server Controllers (B-BC).
   e. Standalone Digital Control Units (SDCUs): Provide the necessary quantity

and types of SDCUs to meet the requirements of the project for mechanical equipment control including air handlers, central plant control, and terminal unit control. Each SDCU will operate completely standalone, containing all of the I/O and programs to control its associated equipment. BACnet SDCUs shall be tested and certified by the BACnet Testing Laboratory (BTL).

3. The Local Area Network (LAN) shall be either a 10 or 100 Mpbs Ethernet network supporting BACnet, Modbus, Java, XML, HTTP, and CORBA IIOP for maximum flexibility for integration of building data with enterprise information systems and providing support for multiple Network Server Controllers (NSCs), user workstations and a local host computer system**.**

4. The Enterprise Ethernet (IEEE 802.3) LAN shall utilize Carrier Sense Multiple/Access/Collision Detect (CSMA/CD), Address Resolution Protocol (ARP) and User Datagram Protocol (UDP) operating at 10 or 100 Mbps.

5. The system shall enable an open architecture that utilizes EIA standard 709.1, the LonTalk™ protocol and/or ANSI / ASHRAE™ Standard 135-2007, BACnet functionality to assure interoperability between all system components. Native support for the LonTalk™ protocol and the ANSI / ASHRAE™ Standard 135-2007, BACnet protocol are required to assure that the project is fully supported by the HVAC open protocols to reduce future building maintenance, upgrade, and expansion costs.

6. The system shall enable an architecture that utilizes a MS/TP selectable 9.6-76.8 KBaud protocol, as the common communication protocol between all controllers and integral ANSI / ASHRAE™ Standard 135-2008, BACnet functionality to assure interoperability between all system components. The AAC shall be capable of communicating as a MS/TP device or as a BACnet IP device communicating at 10/100 Mbps on a TCP/IP trunk. The ANSI / ASHRAE™ Standard 135-2008, BACnet protocol is required to assure that the project is fully supported by the leading HVAC open protocol to reduce future building maintenance, upgrade, and expansion costs.

7. LonTalk™ packets may be encapsulated into TCP/IP messages to take advantage of existing infrastructure or to increase network bandwidth where necessary or desired.

   a. Any such encapsulation of the LonTalk™ protocol into IP datagrams shall conform to existing LonMark™ guide functionality lines for such encapsulation and shall be based on industry standard protocols.
   b. The products used in constructing the BMS shall be LonMark™ compliant.
   c. In those instances in which Lon-Mark™ devices are not available, the BMS contractor shall provide device resource files and external interface definitions for LonMark devices.

8. The software tools required for network management of the LonTalk™ protocol and the ANSI / ASHRAE™ Standard 135-2008, BACnet protocol must be provided with the system. Drawings are diagrammatic only. Equipment and labor not

specifically referred to herein or on the plans and are required to meet the functional intent, shall be provided without additional cost to the Owner. Minimum BACnet compliance is Level 4; with the ability to support data read and write functionality. Physical connection of BACnet devices shall be via Ethernet IP or MS/TP. Physical connection of LonWorks devices shall be via Ethernet IP or FTT-10A.

9. The system shall support Modbus TCP and RTU protocols natively, and not require the use of gateways.

10. Complete temperature control system to be DDC with electronic sensors and electronic/electric actuation of Mechanical Equipment Room (MER) valves and dampers and electronic actuation of terminal equipment valves and actuators as specified herein. The BMS is intended to seamlessly connect devices throughout the building regardless of subsystem type, i.e. variable frequency drives, low voltage lighting systems, electrical circuit breakers, power metering and card access should easily coexist on the same network channel.

    a. The supplied system must incorporate the ability to access all data using Java enabled browsers without requiring proprietary operator interface and configuration programs.
    b. Data shall reside on a supplier-installed server for all database access.
    c. A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer's internal Intranet network.

11. All work described in this section shall be installed, wired, and circuit tested by factory certified technicians qualified for this work and in the regular employment of the approved manufacturer's local field office. The approved manufacturer's local field office shall have a minimum of 10 years of installation experience with the manufacturer and shall provide documentation in the bid and submittal package verifying longevity of the installing company's relationship with the manufacturer when requested. Supervision, hardware and software engineering, and checkout of the system shall be by the employees of the approved manufacturer's local field office and shall not be subcontracted. The control contractor shall have an in place support facility within 200 miles of the site with factory certified technicians and engineers, spare parts inventory and all necessary test and diagnostic equipment for the installed system, and the control contractor shall have 24 hours/day, 7 days/week emergency service available.

12. Provide the Commissioning, configuration and diagnostic tool (CCDT), color display personal computer, software, and interfaces to provide uploading/downloading of High Point Count Controllers (AAC), Unitary Equipment Controllers (UEC) and VAV controllers (VAVDDC) monitoring all BACnet objects, monitoring overrides of all controller physical input/output points, and editing of controller resident time schedules.

13. Provide (existing) a Portable Operator's Terminal (POT) color display personal computer, software, and interfaces to provide uploading/downloading of Custom Application Controller and Application Specific Controllers databases, monitoring of

all LonMark™ Standard Network Variables Types (SNVTs) including display of all bound SNVTs, monitoring and overrides of all controller physical input/output points, and editing of controller resident time schedules.

14. Deployed system must be configured to comply with United States DIACAP (Department of Defense Information Assurance Certification and Accreditation Process) so that no category 1 vulnerabilities are detected during the DIACAP process.

15. The system shall have the capability to provide a web-based AMBCx (automated monitoring based commissioning) system. The AMBCx system shall be able to interface directly with the project BAS and energy/performance metering system to provide information on HVAC systems that are being controlled. Pricing is to be a separate line item from the BAS proposal. See specification section 25 08 01 for exact requirements.

16. The system shall have the capability to provide a web-based APEO (automated predictive energy optimization) system and enable effective participation in local utility Demand Response (DR) programs. The vendor shall provide software and ongoing services that will identify actionable energy saving and peak reduction opportunities to assist the facility in achieving its energy and sustainability objectives, and automatically and continuously operate the systems necessary to achieve the targeted savings and reductions. Pricing is to be a separate line item from the BAS proposal. See specification section 25 13 13 for exact requirements.

G. WORK BY OTHERS

1. The BAS Contractor shall cooperate with other contractors performing work on this project necessary to achieve a complete and neat installation. To that end, each contractor shall consult the drawings and specifications for all trades to determine the nature and extent of others' work.

2. The BAS Contractor shall furnish all control valves, sensor wells, flow meters and other similar equipment for installation by the Mechanical Contractor unless scheduled or specified to be provided with the equipment.

H. CODE COMPLIANCE

1. Provide BAS components and ancillary equipment, which are UL-916 listed and labeled.

2. All equipment or piping used in conditioned air streams, spaces or return air plenums shall comply with NFPA 90A Flame/Smoke/Fuel contribution rating of 25/50/0 and all applicable building codes or requirements.

3. All wiring shall conform to the National Electrical Code.

4. All smoke dampers shall be rated in accordance with UL 555S.

5. Comply with FCC rules, Part 15 regarding Class A radiation for computing devices

and low power communication equipment operating in commercial environments.

6. Comply with FCC, Part 68 rules for telephone modems and data sets.

I. SUBMITTALS

1. All shop drawings shall be prepared in Visio Professional or AutoCAD software. In addition to the drawings, the Contractor shall furnish a CD containing the identical information.

2. Shop drawings shall include a riser diagram depicting locations of all controllers and workstations, with associated network wiring. Also included shall be individual schematics of each mechanical system showing all connected points with reference to their associated controller. Typicals will be allowed where appropriate.

3. Submittal data shall contain manufacturer's data on all hardware and software products required by the specification. Valve, damper and air flow station schedules shall indicate size, configuration, capacity and location of all equipment.

4. Submittals shall contain narrative descriptions of sequences of operation. Diagrams shall be on 11" by 17" foldouts.

5. Submit five (5) copies of submittal data and shop drawings to the Engineer for review prior to ordering or fabrication of the equipment. The Contractor, prior to submitting, shall check all documents for accuracy.

6. The Engineer will make corrections, if required, and return to the Contractor.

7. The following is a list of post construction submittals that shall be updated to reflect any changes during construction and re-submitted as "As-Built".

   a. System architecture drawing.
   b. Layout drawing for each control panel
   c. Wiring diagram for individual components
   d. System flow diagram for each controlled system
   e. Instrumentation list for each controlled system
   f. Sequence of control
   g. Operation and Maintenance Manuals

8. Information common to the entire system shall be provided. This shall include but not be limited to the following.

   a. Product manuals for the key software tasks.
   b. Operating the system.
   c. Administrating the system.
   d. Engineering the operator workstation.
   e. Application programming.
   f. Engineering the network.
   g. Setting up the web server.

h. Report creation.
i. Graphics creation.
j. All other engineering tasks.
k. System Architecture Diagram.
l. Reference the product manual that includes instructions on executing the task.
m. Names, addresses, and telephone numbers of installing contractors and service representatives for equipment and control systems.
n. Licenses, guarantees, and warranty documents for equipment and systems.
o. Submit one copy for each building, plus two extra copies.

9. Information common to the systems in a single building shall be provided.

a. System architecture diagram for components within the building annotated with specific location information.
b. As-built drawing for each control panel.
c. As-built wiring design diagram for all components.
d. Installation design details for each I/O device.
e. As-built system flow diagram for each system.
f. Sequence of control for each system.
g. Product data sheet for each component.
h. Installation data sheet for each component.
i. Submit two copies for each building and two extra copies.

10. Software shall be provided:

a. Submit a copy of all software installed on the servers and workstations.
b. Submit all licensing information for all software installed on the servers and workstations.
c. Submit a copy of all software used to execute the project even if the software was not installed on the servers and workstations.
d. Submit all licensing information for all of the software used to execute the project.
e. All software revisions shall be as installed at the time of the system acceptance.
f. Firmware Files
g. Submit a copy of all firmware files that were downloaded to or pre-installed on any devices installed as part of this project.
h. This does not apply to firmware that is permanently burned on a chip at the factory and can only be replaced by replacing the chip.
i. Submit a copy of all application files that were created during the execution of the project.
j. Submit a copy of all graphic page files created during the execution of the project.

J. COORDINATION

1. Coordinate equipment from other divisions including "Intrusion Detection," "Lighting Controls," "Motor Control Centers," "Panel boards," "Miscellaneous

Integrated systems" and "Fire Alarm" to achieve compatibility with equipment that interfaces with those systems. It is expected that qualified vendor representatives will be present during startup for any of the above mentioned integrations as required. Costs for this support should be covered by the associated vendor as part of their base bid.

2. Coordinate supply of conditioned electrical circuits for control units and operator workstation.

3. Coordinate location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete".

4. Coordinate with the Owner's IT department on locations for NSC's, Ethernet communication cabling and TCP/IP addresses.

K. OWNERSHIP

1. The Owner shall retain licenses to software for this project.

2. The Owner shall sign a copy of the manufacturer's standard software and firmware licensing agreement as a condition off this contractor. Such license shall grant use of all programs and application software to the Owner as defined by the manufacturer's license agreement, but shall protect the manufacturer's rights to disclosure of Trade Secrets contained within such software.

3. The licensing agreement shall not preclude the use of the software by individuals under contract to the owner for commissioning, servicing or altering the system in the future. Use of the software by individuals under contract to the owner shall be restricted to use on the owner's computers and only for the purpose of commissioning, servicing, or altering the installed system.

4. All project developed software, files and documentation shall become the property of the Owner. These include but are not limited to:

   a. Server and workstation software
   b. Application programming tools
   c. Configuration tools
   d. Network diagnostic tools
   e. Addressing tools
   f. Application files
   g. Configuration files
   h. Graphic files
   i. Report files
   j. Graphic symbol libraries
   k. All documentation

L. QUALITY ASSURANCE – SYSTEM STARTUP AND COMMISSIONING

1. Each point in the system shall be tested for both hardware and software functionality. In addition, each mechanical and electrical system under control of the BAS will be tested against the appropriate sequence of operation specified herein. Successful completion of the system test shall constitute the beginning of the warranty period. A written report will be submitted to the owner indicating that the installed system functions in accordance with the plans and specifications.

2. The BAS contractor shall commission and set in operating condition all major equipment and systems, such as the chilled water, hot water and all air handling systems, in the presence of the equipment manufacturer's representatives, as applicable, and the Owner and Architect's representatives.

3. The BAS Contractor shall provide a technician for manpower and engineering services required to assist the HVAC Contractor and Balancing Contractor in testing, adjusting, and balancing all systems in the building. The BAS Contractor shall coordinate all requirements to provide a complete air balance with the Balancing Contractor and shall include all labor and materials in his contract.

4. Startup Testing shall be performed for each task on the startup test checklist, which shall be initialed by the technician and dated upon test completion. Any deviations from the submitted installation plan shall also be recorded.

5. Required elements of the startup testing include:

    a. Measurement of voltage sources, primary and secondary
    b. Verification of proper controller power wiring.
    c. Verification of component inventory when compared to the submittals.
    d. Verification of labeling on components and wiring.
    e. Verification of connection integrity and quality (loose strands and tight connections).
    f. Verification of bus topology, grounding of shields and installation of termination devices.
    g. Verification of point checkout.
    h. Each I/O device is landed per the submittals and functions per the sequence of control.
    i. Analog sensors are properly scaled and a value is reported
    j. Binary sensors have the correct normal position and the state is correctly reported.
    k. Analog outputs have the correct normal position and move full stroke when so commanded.
    l. Binary outputs have the correct normal state and respond appropriately to energize/de-energize commands.
    m. Documentation of analog sensor calibration (measured value, reported value and calculated offset).
    n. Documentation of Loop tuning (sample rate, gain and integral time constant).

6. A Startup and Testing Report shall be provided upon test completion.

M. WARRANTY AND MAINTENANCE

1. All components, system software, and parts furnished and installed by the BMS contractor shall be guaranteed against defects in materials and workmanship for 1 year of substantial completion. Labor to repair, reprogram, or replace these components shall be furnished by the BMS contractor at no charge during normal working hours during the warranty period. Materials furnished but not installed by the BMS contractor shall be covered to the extent of the product only. Installation labor shall be the responsibility of the trade contractor performing the installation. All corrective software modifications made during warranty periods shall be updated on all user documentation and on user and manufacturer archived software disks. The Contractor shall respond to the owner's request for warranty service within 24 standard working hours.

N. TRAINING

1. The BAS Contractor shall provide on-site training to the Owner's representative and maintenance personnel per the following description:

2. On-site training shall consist of a minimum of (2) hours of hands-on instruction geared at the operation and maintenance of the systems. The curriculum shall include:

   a. System Overview
   b. System Software and Operation
   c. System access
   d. Software features overview
   e. Changing setpoints and other attributes
   f. Scheduling
   g. Editing programmed variables
   h. Displaying color graphics
   i. Running reports
   j. Workstation maintenance
   k. Viewing application programming
   l. Operational sequences including start-up, shutdown, adjusting and balancing.
   m. Equipment maintenance.

23 09 00.2 PRODUCTS

A. PRE-APPROVED MANUFACTURERS

1. Subject to compliance with requirements, provide products by one of the following pre-qualified manufacturers:

   a. Electric Components

      1) Schneider-Electric Field Devices

   b. Electronic Components

1) Schneider-Electric Field Devices

c. Direct Digital Control Systems Devices:

1) Schneider-Electric I/A BACnet, LON, or NETWORK 8000 series installed by approved manufacturer's local field office.

B. SYSTEM ARCHITECTURE

1. General

a. The Building Automation System (BAS) shall consist of Network Server/Controllers (NSCs), a family of Standalone Digital Control Units (SDCUs), Administration and Programming Workstations (APWs), and Web-based Operator Workstations (WOWs). The BAS shall provide control, alarm detection, scheduling, reporting and information management for the entire facility, and Wide Area Network (WAN) if applicable.

b. An Enterprise Level BAS shall consist of an Enterprise Server, which enables multiple NSCs (including all graphics, alarms, schedules, trends, programming, and configuration) to be accessible from a single Workstation simultaneously for operations and engineering tasks.

c. The Enterprise Level BAS shall be able to host up to 250 servers, or NSCs, beneath it.

d. For Enterprise reporting capability and robust reporting capability outside of the trend chart and listing ability of the Workstation, a Reports Server shall be installed on a Microsoft Windows based computer. The Reports Server can be installed on the same computer as the Enterprise Server.

e. The system shall be designed with a top-level 10/100bT Ethernet network, using the BACnet/IP, LonWorks IP, and/or Modbus TCP protocol.

f. Modbus RTU/ASCII (and J-bus), Modbus TCP, BACnet MS/TP, BACnet IP, LonTalk FTT-10A, and WebServices shall be native to the NSCs. There shall not be a need to provide multiple NSCs to support all the network protocols, nor should there be a need to supply additional software to allow all three protocols to be natively supported. A sub-network of SDCUs using the BACnet MS/TP, LonTalk FTT-10A, and/or Modbus RTU protocol shall connect the local, stand-alone controllers with Ethernet-level Network Server Controllers/IP Routers.

2. TCP/IP Level

a. The TCP/IP layer connects all of the buildings on a single Wide Area Network (WAN) isolated behind the campus firewall. Fixed IP addresses for connections to the campus WAN shall be used for each device that connects to the WAN.

3. Fieldbus Level with Standalone Digital Control Units (SDCUs)

a. The fieldbus layer shall be support all of the following types of SDCUs:

1) BACnet SDCU requirements: The system shall consist of one or

more BACnet MS/TP field buses managed by the Network Server Controller. Minimum speed shall be 76.8kbps. The field bus layer consists of an RS485, token passing bus that supports up to 127 Standalone Digital Control Units (SDCUs) for operation of HVAC and lighting equipment. These devices shall conform to BACnet standard 135-2007. The NSCs shall be capable of at least two BACnet MS/TP field buses for a total capability of 254 SDCUs per NSC.

2) LonWorks SDCU requirements: The system shall consist of one or more LonWorks FTT-10A field buses managed by the Network Server Controller. Minimum speed shall be 76.8kbps. The field bus layer shall consist of up to 64 Lonworks SDCUs using peer-to-peer, event-driven communication for operation of HVAC and lighting equipment. If using TAC Xenta controllers, a total combination of Xenta and LonWorks SDCUs should consist of up to 64 in total, with a maximum of 30 for the Xenta line. If using I/A MNL controllers only, you may have up to 127 SDCUs per field bus level.

3) Modbus SDCU requirements: The system shall consist of one or more Modbus RTU (RS-485 or RS-232) field buses managed by the Network Server Controller. The field bus layer shall consist of up to 31 SDCUs for operation of HVAC, power metering, and lighting equipment. If utilizing Modbus TCP, the field bus layer shall consist of up to 100 SDCUs for operation of HVAC, power metering, and lighting equipment. The NSCs shall be capable of at least two Modbus RTU field buses for a total capability of 62 SDCUs per NSC.

4) NETWORK 8000 SDCU requirements: The system shall consist of one or more ASD or LCM field buses managed by the Network Server Controller. The field bus layer shall consist of up to 128 ASD SDCUs or 31 LCM SDCUs for operation of HVAC, power metering, and lighting equipment.

5) I/NET SDCU requirements: The system shall consist of one or more controller LANs and subLANs managed by the Network Server Controller. The network shall consist of up to 100,000 I/NET points capable through numerous links and devices for operation of HVAC, power metering, and lighting equipment.

4. BAS LAN Segmentation

a. The BAS shall be capable of being segmented, through software, into multiple local area networks (LANs) distributed over a wide area network (WAN). Workstations can manage a single LAN (or building), and/or the entire system with all portions of that LAN maintaining its own, current database.

5. Standard Network Support

a. All NSCs, Workstation(s) and Servers shall be capable of residing directly on the owner's Ethernet TCP/IP LAN/WAN with no required gateways. Furthermore, the NSC's, Workstation(s), and Server(s) shall be capable of

using standard, commercially available, off-the-shelf Ethernet infrastructure components such as routers, switches and hubs. With this design the owner may utilize the investment of an existing or new enterprise network or structured cabling system. This also allows the option of the maintenance of the LAN/WAN to be performed by the owner's Information Systems Department as all devices utilize standard TCP/IP components.

6. System Expansion

   a. The BAS system shall be scalable and expandable at all levels of the system using the same software interface, and the same TCP/IP level and fieldbus level controllers. Systems that require replacement of either the workstation software or field controllers in order to expand the system shall not be acceptable.
   b. Web-based operation shall be supported directly by the NSCs and require no additional software, other than a Java supported network browser.
   c. The system shall be capable of using graphical and/or line application programming language for the Network Server Controllers.

7. Support For Open Systems Protocols

   a. All Network Server Controllers must natively support the BACnet IP, BACnet MS/TP, LonWorks FTT-10, Modbus TCP, Modbus RTU (RS-485 and RS-232), and Modbus ASCII protocols.

C. OPERATOR WORKSTATION REQUIREMENTS

1. General

   a. The operator workstation portion of the BAS shall consist of one or more full-powered configuration and programming workstations, and one or more web-based operator workstations. For this project provide a minimum of 10 concurrent operator users and/or 2 concurrent engineering users within the enterprise server.
   b. The programming and configuration workstation software shall allow any user with adequate permission to create and/or modify any or all parts of the NSC and/or Enterprise Server database.
   c. All configuration workstations shall be personal computers operating under the Microsoft Windows operating system. The application software shall be capable of communication to all Network Server Controllers and shall feature high-resolution color graphics, alarming, trend charting. It shall be user configurable for all data collection and data presentation functions.
   d. A minimum of 1 Workstation shall be allowed on the Ethernet network. In this client/server configuration, any changes or additions made from one workstation will automatically appear on all other workstations since the changes are accomplished to the databases within the NSC. Systems with a central database will not be acceptable.

2. Administration/Programming Workstation & Enterprise Server Requirements

a. The Enterprise Server (existing) shall consist of the following:

1) Processor

a) 2.6 GHz or higher

2) Memory

a) 4GB or higher

3) Operating systems:

a) Microsoft Windows 7 32-bit (Professional, Enterprise, or Ultimate)
b) Microsoft Windows 7 64-bit (Professional, Enterprise, or Ultimate)
c) Microsoft Windows 8.1 32-bit (Professional or Enterprise)
d) Microsoft Windows 8.1 64-bit (Professional or Enterprise)
e) Microsoft Windows Server 2008 R2 64-bit (Standard, Enterprise, Datacenter, Web, or Itanium)
f) Microsoft Windows Server 2012 R2 64-bit (Standard, Datacenter, Essentials, or Foundation)

4) 10/100MBPS Ethernet NIC
5) 250 GB hard disk
6) Required additional software:

a) Microsoft .Net 4.5

7) License agreement for all applicable software

b. The workstation (existing) shall consist of the following:

1) Processor

a) 2.0 GHz or higher

2) Memory

a) 4GB or higher

3) Operating systems:

a) Microsoft Windows 7 32-bit (Professional, Enterprise, or Ultimate)
b) Microsoft Windows 7 64-bit (Professional, Enterprise, or Ultimate)
c) Microsoft Windows 8.1 32-bit (Professional or Enterprise)

d) Microsoft Windows 8.1 64-bit (Professional or Enterprise)
e) Microsoft Windows Server 2008 R2 64-bit (Standard, Enterprise, Datacenter, Web, or Itanium)
f) Microsoft Windows Server 2012 R2 64-bit (Standard, Datacenter, Essentials, or Foundation)

4) Serial port, parallel port, USB port
5) 10/100MBPS Ethernet NIC
6) 20 GB hard disk
7) DVD drive
8) High resolution (minimum 1280 x 1024), 17" flat panel display
9) Optical mouse and full function keyboard
10) Audio sound card and speakers
11) Required additional software:

a) Microsoft .Net 4.5

12) License agreement for all applicable software.

3. Web-Based Operator PC Requirements

a. Any user on the network can access the system, using the following software:

1) Internet Explorer 10 or 11
2) Mozilla Firefox 26
3) Java-enabled-7.0 Update 51 or newer

4. General Administration and Programming Workstation Software

a. System architecture shall be truly client server in that the Workstation shall operate as the client while the NSCs shall operate as the servers. The client is responsible for the data presentation and validation of inputs while the server is responsible for data gathering and delivery.
b. The workstation functions shall include monitoring and programming of all DDC controllers. Monitoring consists of alarming, reporting, graphic displays, long term data storage, automatic data collection, and operator-initiated control actions such as schedule and setpoint adjustments.
c. Programming of SDCUs shall be capable of being done either off-line or on-line from any operator workstation. All information will be available in graphic or text displays stored at the NSC. Graphic displays will feature animation effects to enhance the presentation of the data, to alert operators of problems, and to facilitate location of information throughout the DDC system. All operator functions shall be selectable through a mouse.

5. User Interface

a. The BAS workstation software shall allow the creation of a custom, browser-style interface linked to the user when logging into any

workstation. Additionally, it shall be possible to create customized workspaces that can be assigned to user groups. This interface shall support the creation of "hot-spots" that the user may link to view/edit any object in the system or run any object editor or configuration tool contained in the software. Furthermore, this interface must be able to be configured to become a user's "PC Desktop" – with all the links that a user needs to run other applications. This, along with the Windows user security capabilities, will enable a system administrator to setup workstation accounts that not only limit the capabilities of the user within the BAS software, but may also limit what a user can do on the PC and/or LAN/WAN. This might be used to ensure, for example, that the user of an alarm monitoring workstation is unable to shutdown the active alarm viewer and/or unable to load software onto the PC.

b. System shall be able to automatically switch between displayed metric vs. imperial units based on the workstation/webstations localization.

c. The BMS workstation/webstations shall be capable of multiple language display, including English, Spanish, German, French, Japanese, Finish, Swedish, and traditional and simplified Chinese.

d. Servers and clients shall have the ability to be located in different time zones, which are then synchronized via the NTP server.

6. User Security

a. The software shall be designed so that each user of the software can have a unique username and password. This username/password combination shall be linked to a set of capabilities within the software, set by and editable only by, a system administrator. The sets of capabilities shall range from View only, Acknowledge alarms, Enable/disable and change values, Program, and Administer. The system shall allow the above capabilities to be applied independently to each and every class of object in the system. The system must allow a minimum of 256 users to be configured per workstation. Additionally, the software shall enable the ability to add/remove users based upon Microsoft Windows Security Domains that enable the customer IT department to assist in user access.

7. Configuration Interface

a. The workstation software shall use a familiar Windows Explorer style interface for an operator or programmer to view and/or edit any object (controller, point, alarm, report, schedule, etc.) in the entire system. In addition, this interface shall present a "network map" of all controllers and their associated points, programs, graphics, alarms, and reports in an easy to understand structure. All object names shall be alphanumeric and use Windows long filename conventions.

b. The configuration interface shall also include support for user defined object types. These object types shall be used as building blocks for the creation of the BAS database. They shall be created form the base object types within the system input, output, string variables, setpoints, etc., alarm algorithms, alarm notification objects, reports, graphics displays, schedules, and programs. Groups of user defined object types shall be able

to be set up as a predefined aggregate of subsystems and systems. The configuration interface shall support copying/pasting and exporting/importing portions of the database for additional efficiency. The system shall also maintain a link to all "child" objects created. If a user wishes to make a change to a parent object, the software shall ask the user if he/she wants to update all of the child objects with the change.

8. Color Graphic Displays

a. The system shall allow for the creation of user defined, color graphic displays for the viewing of mechanical and electrical systems, or building schematics. These graphics shall contain point information from the database including any attributes associated with the point (engineering units, etc.). In addition operators shall be able to command equipment or change setpoints from a graphic through the use of the mouse.

b. Requirements of the color graphic subsystem include:

1) At a minimum, the user shall have the ability to import .gif, .png, .bmp, .jpeg, .tif, and CAD generated picture files as background displays, and layering shall be possible.
2) It shall be possible for the user to use JavaScript to customize the behavior of each graphic.
3) The editor shall use Scalable Vector Graphics (SVG) technology.
4) A built-in library of animated objects such as dampers, fans, pumps, buttons, knobs, gauges, ad graphs which can be "dropped" on a graphic through the use of a software configuration "wizard". These objects shall enable operators to interact with the graphic displays in a manner that mimics their mechanical equivalents found on field installed control panels.
5) Using the mouse, operators shall be able to adjust setpoints, start or stop equipment, modify PID loop parameters, or change schedules.
6) Status changes or alarm conditions must be able to be highlighted by objects changing screen location, size, color, text, blinking or changing from one display to another.
7) Ability to link graphic displays through user defined objects, alarm testing, or the result of a mathematical expression. Operators must be able to change from one graphic to another by selecting an object with a mouse - no menus will be required.
8) It shall be possible to create and save graphical components and JavaScript code in reusable and transferrable, customized libraries.
9) Graphics should rescale based on whatever monitor or viewing device is being used.
10) Be able to create graphics on varying layers the can be moved and repeated.
11) Be able to create graphics within varying window panes that can be moved and/or re-referenced. For example, creating the graphical menu within a pane and referencing it on every graphics page, therefore not rebuilding thus allowing for a single spot for updates that get pushed to all the pages that reference it.

c. Additionally, the Graphics Editor portion of the Engineering Software shall provide the following capabilities:

1) Create and save pages.
2) Group and ungroup symbols.
3) Modify an existing symbol.
4) Modify an existing graphic page.
5) Rotate and mirror a symbol.
6) Place a symbol on a page.
7) Place analog dynamic data in decimal format on a page.
8) Place binary dynamic data using state descriptors on a page.
9) Create motion through the use of animated .gif files or JavaScript.
10) Place test mode indication on a page.
11) Place manual mode indication on a page.
12) Place links using a fixed symbol or flyover on a page.
13) Links to other graphics.
14) Links to web sites.
15) Links to notes.
16) Links to time schedules.
17) Links to any .exe file on the operator work station.
18) Links to .doc files.
19) Assign a background color.
20) Assign a foreground color.
21) Place alarm indicators on a page.
22) Change symbol/text/value color as a function of an analog variable.
23) Change a symbol/text/value color as a function of a binary state.
24) Change symbol/text/value as a function of a binary state.
25) All symbols used by Schneider Electric Buildings Business in the creation of graphic pages shall be saved to a library file for use by the owner.

9. Automatic monitoring

a. The software shall allow for the automatic collection of data and reporting from any controller or NSC. The frequency of data collection shall be user-configurable.

10. Alarm Management

a. The software shall be capable of accepting alarms directly from NSCs or controllers, or generating alarms based on evaluation of data in controllers and comparing to limits or conditional equations configured through the software. Any alarm (regardless of its origination) will be integrated into the overall alarm management system and will appear in all standard alarm reports, be available for operator acknowledgment, and have the option for displaying graphics, or reports.
b. Alarm management features shall include:

1) A minimum of 1000 alarm notification levels. Each notification level

will establish a unique set of parameters for controlling alarm display, distribution, acknowledgment, keyboard annunciation, and record keeping.

2) Automatic logging in the database of the alarm message, point name, point value, source device, timestamp of alarm, username and time of acknowledgement, username and time of alarm silence (soft acknowledgement)
3) Playing an audible sound on alarm initiation or return to normal.
4) Sending an email page to anyone specifically listed on the initial occurrence of an alarm. The ability to utilize email paging of alarms shall be a standard feature of the software integrated with the operating system's mail application interface (MAPI). No special software interfaces shall be required and no email client software must be running in order for email to be distributed.
5) Individual alarms shall be able to be re-routed to a user at user-specified times and dates. For example, a critical high temp alarm can be configured to be routed to a Facilities Dept. workstation during normal working hours (7am-6pm, Mon-Fri) and to a Central Alarming workstation at all other times.
6) An active alarm viewer shall be included which can be customized for each user or user type to hide or display any alarm attributes.
7) The active alarm viewer can be configured such that an operator must type in text in an alarm entry and/or pick from a drop-down list of user actions for certain alarms.
8) The active alarm viewer can be configured such that an operator must type in text in an alarm entry and/or pick from a drop-down list of causes for certain alarms. This ensures accountability (audit trail) for the response to critical alarms.
9) The active alarm viewer can be configured such that an operator must confirm that all of the steps in a check list have been accomplished prior to acknowledging the alarm.
10. The active alarm viewer shall, if filtered, show the quantity of visible and total number of alarms that are not equal to 'normal' and the quantity of disabled and hidden alarms.
11) An operator shall have the capability to assign an alarm to another user of the system.

11. Report Generation
    a. The Reports Server shall be able to process large amounts of data and produce meaningful reports to facilitate analysis and optimization of each installation.
    b. Reports shall be possible to generate and view from the operator Workstation, and/or Webstation, and/or directly from a reports-only web interface.
    c. A library of predefined automatically generated reports that prompt users for input prior to generation shall be available. The properties and configurations made to these reports shall be possible to save as Dashboard reports, so that the configurations are saved for future used.
    d. It shall be possible to create reports standard tools, such as Microsoft Report Builder 2.0 or Visual Studio, shall be used for customized reports.

e. Additional reports or sets of reports shall be downloadable, transferrable, and importable
f. All reports shall be able to be set up to automatically run or be generated on demand.
g. Each report shall be capable of being automatically emailed to a recipient in Microsoft Word, Excel, and/or Adobe .pdf format.
h. Reports can be of any length and contain any point attributes from any controller on the network.
i. Image management functionality shall be possible to enable the system administrators to easily upload new logos or images to the system.
j. It shall be possible to run other executable programs whenever a report is initiated.
k. Report Generator activity can be tied to the alarm management system, so that any of the configured reports can be displayed in response to an alarm condition.
l. Minimum supplied reports shall include:

1) Activities Per Server Report
2) Activities Per User Report
3) Alarm Amount by Category Report
4) Alarm Amount by Type Report
5) Alarms Per Sever Report
6) Current Alarm Report
7) Most Active Alarm Report
8) System Errors Per Server Report
9) Top Activities Report
10) Top Alarms Report
11) Top System Errors Report
12) Trend Log Comparison Report
13) User Logins Report
14) Users and Groups Reports

m. Minimum Energy Reports shall include:

1) Energy Monitoring Calendar Consumption Report: Shall provide an interactive report that shows the energy usage on one or multiple selected days.
2) Energy Monitoring Consumption Breakdown Report: Shall provide a report on energy consumption broken down using sub-metering.
3) Energy Monitoring Consumption Report: Shall show the energy consumption against a specified target value.

n. Reports Server Hardware Requirements

1) Processor

a) 2.0 GHz or higher

2) Memory

a) 8GB or higher

3) Hard Disk

a) 500 GB or higher

o. Reports Server Software Requirements

1. Operating System:

a) Microsoft Windows Server 2008 R2 64-bit (Standard, Enterprise, Datacenter, Web, or Itanium)
b) Microsoft Windows Server 2012 R2 64-bit (Standard, Datacenter, Essentials, Foundation

2. SQL Versions:

a) Microsoft SQL Server 2008 Express with Advanced Services (64-bit)
b) Microsoft SQL Server 2008 R2 Standard (64-bit)
c) Microsoft SQL Server 2012 Express or Standard Edition

3. Additional required software

a) Microsoft .Net 4.5

12. Scheduling

a. From the workstation or webstation, it shall be possible to configure and download schedules for any of the controllers on the network.
b. Time of day schedules shall be in a calendar style and viewable in both a graphical and tabular view.
c. Schedules shall be programmable for a minimum of one year in advance.
d. To change the schedule for a particular day, a user shall simply select the day and make the desired modifications.
e. Additionally, from the operator webstations, each schedule will appear on the screen viewable as the entire year, monthly, week and day. A simple mouse click shall allow switching between views. It shall also be possible to scroll from one month to the next and view or alter any of the schedule times.
f. Schedules will be assigned to specific controllers and stored in their local RAM memory. Any changes made at the workstation will be automatically updated to the corresponding schedule in the controller.
g. It shall be possible to assign a lead schedule such that shadow/local schedules are updated based upon changes in the Lead.
h. It shall be possible to assign a list(s) of exception event days, dates, date ranges to a schedule.
i. It shall be possible to view combined views showing the calendar and all prioritized exemptions on one screen.
j. It should accommodate a minimum of 16 priority levels.

k. Values should be able to be controlled directly from a schedule, without the need for special program logic.

13. Programmer's Environment

a. Programming in the NSC shall be either in graphical block format or line-programming format or both.
b. Programming of the NSC shall be available offline from system prior to deployment into the field. All engineering tasks shall be possible, except, of course, the viewing of live tasks or values.
c. The programmer's environment will include access to a superset of the same programming language supported in the SDCUs.
d. NSC devices will support both script programming language as well as the graphical function block programming language. For both languages, the programmer will be able to configure application software for custom program development, and write global control programs.
e. It shall be possible to save custom programs as libraries for reuse throughout the system. A wizard tool shall be available for loading programs from a library file in the program editor.
f. It shall be possible to view graphical programming live and real-time from the Workstation.
g. The system shall be capable of creating 'binding templates' allowing the user to bind multiple points to multiple objects all at once.
h. Key terms should appear when typing (IntelliType).
i. Applications should be able to be assigned different priorities and cycle times for a prioritized execution of different function.
j. The system shall be able to create objects that allow common objects such as power meters, VFD drives, etc. to be integrated into the system with simple import actions without the need of complicated programming or configuration setups.

14. Saving/Reloading

a. The workstation software shall have an application to save and restore NSC and field controller memory files.
b. For the NSC, this application shall not be limited to saving and reloading an entire controller – it must also be able to save/reload individual objects in the controller. This allows off-line debugging of control programs, for example, and then reloading of just the modified information.

15. Audit Trail

a. The workstation software shall automatically log and timestamp every operation that a user performs at a workstation, from logging on and off a workstation to changing a point value, modifying a program, enabling/disabling an object, viewing a graphic display, running a report, modifying a schedule, etc.
b. It shall be possible to view a history of alarms, user actions, and commands for any system object individually or at least the last 5000 records of all events for the entire system from Workstation.

c. It shall be possible to save custom filtered views of event information that are viewable and configurable in Workstation.
d. It shall be capable to search and view all forced values within the system.

16. Fault Tolerant Enterprise Server Operation (Top level NSC)

a. A single component failure in the system shall not cause the entire system to fail. All system users shall be informed of any detectable component failure via an alarm event. System users shall not be logged off as a result of a system failure or switchover.

17. Web-based Operator Software

a. General

1) Day-to-day operation of the system shall be accessible through a standard web browser interface, allowing technicians and operators to view any part of the system from anywhere on the network.
2) The system shall be able to be accessed on site via a mobile device environment with, at a minimum, access to overwrite and view system values.

b. Graphic Displays

1) The browser-based interface must share the same graphical displays as the Administration and Programming Workstations, presenting dynamic data on site layouts, floor plans, and equipment graphics. The browser's graphics shall support commands to change setpoints, enable/disable equipment and start/stop equipment.
2) Through the browser interface, operators must be able to navigate through the entire system, and change the value or status of any point in any controller. Changes are effective immediately to the controller, with a record of the change stored in the system database.

c. Alarm Management

1) Systems requiring additional client software to be installed on a PC for viewing the webstation from that PC will not be considered.
2) Through the browser interface, a live alarm viewer identical to the alarm viewer on the Administration and Programming workstation shall be presented, if the user's password allows it. Users must be able to receive alarms, silence alarms, and acknowledge alarms through a browser. If desired, specific operator text must be able to be added to the alarm record before acknowledgement,

attachments shall be viewable, and alarm checklists shall be available.

18. Groups and Schedules

    a. Through the browser interface, operators must be able to view pre-defined groups of points, with their values updated automatically.
    b. Through the browser interface, operators must be able to change schedules – change start and stop times, add new times to a schedule, and modify calendars.

19. User Accounts and Audit Trail

    a. The same user accounts shall be used for the browser interface and for the operator workstations. Operators must not be forced to memorize multiple passwords.
    b. All commands and user activity through the browser interface shall be recorded in the system's activity log, which can be later searched and retrieved by user, date, or both.

20. Web Services

    a. The installed system shall be able to use web services to "consume" information within the Network Server/Controllers (NSCs) with other products and systems. Inability to perform web services within the NSCs will be unacceptable.

        1) Shall be able to "consume" data into the system via SOAP and REST web services.
        2) Shall be able to "serve" and "consume" data from other Schneider Electric systems such as:

            a) StruxureWare Data Center Expert
            b) StruxureWare Power Monitoring Expec

D. NETWORK SERVER CONTROLLERS (NSCs)

1. Network Router Controllers shall combine both network routing functions, control functions, and server functions into a single unit.

2. The BACnet NSC shall be classified as a "native" BACnet device, supporting the BACnet Network Server Controller (B-BC) profile. Controllers that support a lesser profile such as B-SA are not acceptable. NSCs shall be tested and certified by the BACnet Testing Laboratory (BTL) as BACnet Network Server Controllers (B-BC).

3. The Network Server Controller shall provide the interface between the LAN or WAN and the field control devices, and provide global supervisory control functions over the control devices connected to the NRS.

4. They shall also be responsible for monitoring and controlling their own HVAC

equipment such as an AHU or boiler.

5. They shall also contain graphics, trends, trend charts, alarm views, and other similar presentation objects that can be served to workstations or web-based interfaces. A sufficient number of NSCs shall be supplied to fully meet the requirements of this specification and the attached point list.

6. It shall be capable of executing application control programs to provide:

   a. Calendar functions
   b. Scheduling
   c. Trending
   d. Alarm monitoring and routing
   e. Time synchronization by means of an Internet site including automatic synchronization
   f. Native integration of LonWorks controller data and Modbus controller data or BACnet controller data and Modbus controller data
   g. Network Management functions for all LonWorks based devices

7. Hardware Specifications

   a. Memory:

      1) The operating system of the controller, application programs, and all other portions of the configuration database, shall be stored in non-volatile, FLASH memory. Servers/Controllers shall contain enough memory for the current application, plus required history logging, plus a minimum of 20% additional free memory.

   b. Each NRC shall provide the following on-board hardware for communication:

      1) One 10/100bT Ethernet for communication to Workstations, other NRCs and onto the Internet
      2) Two RS-485 ports for communication to BACnet MSTP bus or serial Modbus (software configurable)
      3) One TP/FT port for communication to LonWorks devices.
      4) One Device USB port
      5) Two host USB Ports

   c. The NSC shall conform to a small footprint no larger than 100W x 125H x 75D mm (3.94W x 4.92H x 2.95D in).

8. Modular Expandability:

   a. The system shall employ a modular I/O design to allow expansion. Input and output capacity is to be provided through plug-in modules of various types. It shall be possible to combine I/O modules as desired to meet the I/O requirements for individual control applications.
   b. One shall be able to "hot-change" (hot-swap) the I/O modules preserving

the system on-line without any intervention on the software; addressing and configuration shall be automatic

c. If for any reason the backplane of the modular I/O system were to fail, I/O module addresses will be protected.

9. Hardware Override Switches:

a. All digital outputs shall, optionally, include three position manual override switches to allow selection of the ON, OFF, or AUTO output state. These switches shall be built into the unit and shall provide feedback to the controller so that the position of the override switch can be obtained through software. In addition each analog output shall be equipped with an override potentiometer to allow manual adjustment of the analog output signal over its full range, when the 3 position manual override switch is placed in the ON position.

10. Universal Input Temperatures

a. All universal inputs directly connected to the NSC via modular expansion shall be capable of using the following thermistors for use in the system without any external converters needed.

1) 10 kohm Type I (Continuum)
2) 10 kohm Type II (I/NET)
3) 10 kohm Type III (Satchwell)
4) 10 kohm Type IV (FD)
5) Linearized 10 kohm Type V (FD w/11k shunt)
6) Linearized 10 kohm (Satchwell)
7) 1.8 kohm (Xenta)
8) 1 kohm (Balco)
9) 20 kohm (Honeywell)
10) 2.2 kohm (Johnson)

b. In addition to the above, the system shall be capable of using the below RTD sensors, however it is not required that all universal inputs be compatible with them.

1) PT100 (Siemens)
2) PT1000 (Sauter)
3) Ni1000 (Danfoss)

11. Local Status Indicator Lamps:

a. The NSC shall provide as a minimum LED indication of CPU status, Ethernet LAN status, and field bus status. For each input or output, provide LED indication of the value of the point (On/Off). The LED indication shall support software configuration to set whether the illumination of the LED corresponds to On or Off or whether the color when illuminated is Red or Green.

12. Real Time Clock (RTC):

a. Each NSC shall include a battery-backed, real time clock, accurate to 10 seconds per day. The RTC shall provide the following: time of day, day, month, year, and day of week. Each NSC will allow for its own UTC offset, depending upon the time zone. When the time zone is set, the NSC will also store the appropriate times for daylight savings time.

13. Power Supply:

a. The 24 VDC power supply for the NSCs shall provide 30 watts of available power for the NSC and associated IO modules. The system shall support the use of more than one power supply if heavily power consuming modules are required.
b. The power supply, NSC, and I/O modules shall connect power wise and communication wise via the separate terminal base allowing for ease of replacement and no separate or loose wiring.

14. Automatic Restart After Power Failure:

a. Upon restoration of power after an outage, the NSC shall automatically and without human intervention update all monitored functions, resume operation based on current, synchronize time and status, and implement special start-up strategies as required.

15. Battery backup:

a. The NSC shall include an on-board battery to back up the controller's RAM memory. The battery shall provide accumulated backup of all RAM and clock functions for at least 30 days. In the case of a power failure, the NSC shall first try to restart from the RAM memory. If that memory is corrupted or unusable, then the NSC shall restart itself from its application program stored in its FLASH memory.

16. Software Specifications

a. The operating system of the controller, application programs, and all other portions of the configuration database such as graphics, trends, alarms, views, etc., shall be stored in non-volatile, FLASH memory. There will be no restrictions placed on the type of application programs in the system. Each NSC shall be capable of parallel processing, executing all control programs simultaneously. Any program may affect the operation of any other program. Each program shall have the full access of all I/O facilities of the processor. This execution of control function shall not be interrupted due to normal user communications including interrogation, program entry, printout of the program for storage, etc.
b. Each NSC shall have an available capacity of 4 GB of memory. This shall represent 2 GB for application and historical data and 2 GB dedicated for backup storage.

17. User Programming Language:

a. The application software shall be user programmable. This includes all strategies, sequences of operation, control algorithms, parameters, and setpoints. The source program shall be either a script-based structured text or graphical function block based and fully programmable by the user. The language shall be structured to allow for the configuration of control programs, schedules, alarms, reports, telecommunications, local displays, mathematical calculations, and histories. Users shall be able to place comments anywhere in the body of either script or function block programs.

b. Network Server Controllers that use a "canned" program method will not be accepted.

18. Control Software:

a. The NSC shall have the ability to perform the following pre-tested control algorithms:

1) Proportional, Integral plus Derivative Control (PID)
2) Two Position Control
3) Digital Filter
4) Ratio Calculator
5) Equipment Cycling Protection

19. Mathematical Functions:

a. Each controller shall be capable of performing basic mathematical functions (+, -, *, /), squares, square roots, exponential, logarithms, Boolean logic statements, or combinations of both. The controllers shall be capable of performing complex logical statements including operators such as >, <, =, and, or, exclusive or, etc. These must be able to be used in the same equations with the mathematical operators and nested up to five parentheses deep.

20. NSCs shall have the ability to perform any or all of the following energy management routines:

a. Time of Day Scheduling
b. Calendar Based Scheduling
c. Holiday Scheduling
d. Temporary Schedule Overrides
e. Optimal Start
f. Optimal Stop
g. Night Setback Control
h. Enthalpy Switchover (Economizer)
i. Peak Demand Limiting
j. Temperature Compensated Duty Cycling
k. CFM Tracking
l. Heating/Cooling Interlock

m. Hot/Cold Deck Reset
n. Hot Water Reset
o. Chilled Water Reset
p. Condenser Water Reset
q. Chiller Sequencing

21. History Logging:

a. Each NSC controller shall be capable of LOCALLY logging any input, output, calculated value or other system variable either over user defined time intervals ranging from 1 second to 1440 minutes or based upon a user configurable change of value. A minimum of 1000 logs, with a minimum of 100,000 records, shall be stored. Each log can record either the instantaneous, average, minimum or maximum value of the point. Logged data shall be downloadable to a higher level NSC long term archiving based upon user-defined time intervals, or manual command.
b. For extended trend logging a minimum of 1500 trends shall be capable, with a minimum number of 600,000 records within.
c. Management of a power meter replacement to ensure meter log data is accurate shall be possible in the NSC.
d. Every hardware input and output point, hosted within the NSC and attached I/O modules, shall be trended automatically without the requirement for manual creation, and each of these logs shall log values based upon a change of value and store at least 500 trend samples before replacing the oldest sample with new data.
e. The presentation of logged data shall be built into the server capabilities of the NSC Presentation can be in time stamped list formats or in a chart format with fully configurable pen colors, weights, scales and time spans.

22. Alarm Management:

a. For each system point, alarms can be created based on high/low limits or in comparison to other point values. All alarms will be tested each scan of the NSC and can result in the display of one or more alarm messages or reports.
b. There is no limit to the number of alarms that can be created for any point
c. Alarms can be configured to be generated based upon a single system condition or multiple system conditions.
d. Alarms will be generated based on an evaluation of the alarm conditions and can be presented to the user in a fully configurable order, by priority, by time, by category, etc. These configurable alarm views will be presented to a user upon logging into the system regardless of whether the log in takes place at a WorkStation or a Webstation.
e. The alarm management system shall support the ability to create and select cause and action notes to be selected and associated with an alarm event. Checklists shall also be possible in order to present to an operator a suggested mode of troubleshooting. When acknowledging an alarm, it shall be possible to assign it to a user of the system such that the user is notified of the assignment and is made responsible for the alarm resolution.
f. Alarms must be capable of being routed to any BACnet workstation that conforms to the B-OWS device profile and uses the BACnet/IP protocol.

23. Embedded Web Server

a. Each NSC must have the ability to serve out web pages containing the same information that is available from the WorkStation. The development of the screens to accomplish shall not require any additional engineering labor over that required to show them at the WorkStation itself.

E. BACnet FIELDBUS AND BACnet SDCUs

1. Networking

a. IP Network: All devices that connect to the WAN shall be capable of operating at 10 megabits per second or 100 megabits per second.
b. IP To Field Bus Routing Devices

1) A Network Server Controller shall be used to provide this functionality.
2) These devices shall be configurable locally with IP crossover cable and configurable via the IP network.
3) The routing configuration shall be such that only data packets from the field bus devices that need to travel over the IP level of the architecture are forwarded.

2. Field Bus Wiring and Termination

a. The wiring of components shall use a bus or daisy chain concept with no tees, stubs, or free topology.
b. Each field bus shall have a termination resistor at both ends of each segment.

3. Repeaters

a. Repeaters are required to connect two segments.

b. Repeaters shall be installed in an enclosure. The enclosure may be in an interstitial space.

4. Field Bus Devices

a. General Requirements

1) Devices shall have a light indicating that they are powered.
2) Devices shall be locally powered. Link powered devices (power is furnished from a central source over the field bus cable) are not acceptable.
3) Application programs shall be stored in a manner such that a loss of power does not result in a loss of the application program or configuration parameter settings. (Battery backup, flash memory, etc.)

5. Network Server Controllers (NSCs)

   a. If NSCs have embedded I/O, all of the requirements for I/O that are described under Advance Application Controllers shall apply.
   b. Shall support the export of data to NSCs from other vendors that support the data sharing, read property service.
   c. hall support the export of data using Change of Value (COV) initiation to NSCs from other vendors that support the subscription to data using the COV concept.
   d. Shall support the export of data to any BACnet OWS that supports the data sharing, read property service.
   e. Shall support the export of data using Change of Value (COV) initiation to any BACnet OWS that supports the subscription to data using the COV concept.
   f. Shall provide trend log support for all of the devices on the field bus. They shall provide sufficient memory to store up to 300 samples for each variable required to be trended by the sequence of control.
   g. Shall support the exporting of trend log data to any BACnet OWS that supports the read range BACnet service for trending.
   h. Shall provide time schedule support for all of the devices on the field bus.
   i. Shall support the editing of time schedule entries from any BACnet OWS that supports the BACnet service for writing of time schedule parameters.
   j. Shall provide alarm message initiation for all alarms conditions from any of the field bus devices.
   k. Shall deliver alarm messages to any BACnet OWS that supports the BACnet service for receiving alarm messages and is configured to be a recipient of the notification.
   l. Shall support alarm acknowledgement from any BACnet OWS that supports the BACnet service for executing alarm/event acknowledgement.
   m. Shall support the control of the out of service property and assignment of value or state to analog and binary objects from any BACnet OWS that supports writing to the out of service property and the value property of analog and binary objects.
   n. Shall support the receipt and response to Time Synchronization commands from any device that supports the BACnet service for initiating time synchronization commands.
   o. Shall support the "Who is?" and "I am." BACnet service.
   p. Shall support the "'Who has?" and "I have." BACnet service.
   q. Shall support Backup and Restore commands from any BACnet OWS that supports the initiation of Backup and Restore commands.
   r. Shall be BTL certified.

6. Advance Application Controllers (AAC)

   a. The key characteristics of a AAC are:

      1) They have physical input and output circuits for the connection of analog input devices, binary input devices, pulse input devices, analog output devices, and binary output devices. The number and

type of input and output devices supported will vary by model.

2) They may or may not provide support for additional input and output devices beyond the number of circuits that are provided on the basic circuit board. Support for additional I/O shall be provided by additional circuit boards that physically connect to the basic controller.
3) The application to be executed by a AAC is created by an application engineer using the vendor's application programming tool.
4) If local time schedules are embedded, the AAC shall support the editing of time schedule entries from any BACnet OWS that supports the BACnet service for writing of time schedule parameters.
5) If local trend logging is embedded, the AAC shall support the exporting of trend log data to any BACnet OWS that supports the read range BACnet service for trending.
6) If local alarm message initiation is embedded, the AAC shall:

    a) Deliver alarm messages to any BACnet OWS that supports the BACnet service for receiving alarm messages and is configured to be a recipient off the alarm message.
    b) Support alarm acknowledgement from any BACnet OWS that supports the BACnet service for executing alarm/event acknowledgement.

7) Shall support the reading of analog and binary data from any BACnet OWS or Building Controller that supports the BACnet service for the reading of data.
8) Shall support the control of the out of service property and assignment of value or state to analog and binary objects from any BACnet OWS that supports writing to the out of service property and the value property of analog and binary objects.
9) Shall support the "Who is" and "I am." BACnet services.
10) Shall support the "Who has" and "I have." BACnet services.

b. Analog Input Circuits

1) The resolution of the A/D chip shall not be greater than 0.01 Volts per increment. For an A/D converter that has a measurement range of 0 to 10 VDC and is 10 bit, the resolution is 10/1024 or 0.00976 Volts per increment.
2) For non-flow sensors, the control logic shall provide support for the use of a calibration offset such that the raw measured value is added to the (+/-) offset to create a calibration value to be used by the control logic and reported to the Operator Workstation (OWS).
3) For flow sensors, the control logic shall provide support for the use of an adjustable gain and an adjustable offset such that a two point calibration concept can be executed (both a low range value and a high range value are adjusted to match values determined by a calibration instrument).

4) For non-linear sensors such as thermistors and flow sensors the AAC shall provide software support for the linearization of the input signal.

c. Binary Input Circuits

1) Dry contact sensors shall wire to the controller with two wires.
2) An external power supply in the sensor circuit shall not be required.

d. Pulse Input Circuits

1) Pulse input sensors shall wire to the controller with two wires.
2) An external power supply in the sensor circuit shall not be required.
3) The pulse input circuit shall be able to process up to 20 pulses per second.

e. True Analog Output Circuits

1) The logical commands shall be processed by a digital to analog (D/A) converter chip. The 0% to 100% control signal shall be scalable to the full output range which shall be either 0 to 10 VDC, 4 to 20 milliamps or 0 to 20 milliamps or to ranges within the full output range (Example: 0 to 100% creates 3 to 6 VDC where the full output range is 0 to 10 VDC).
2) The resolution of the D/A chip shall not be greater than 0.04 Volts per increment or 0.08 milliamps per increment.

f. Binary Output Circuits

1) Single pole, single throw or single pole, double throw relays with support for up to 230 VAC and a maximum current of 2 amps.
2) Voltage sourcing or externally powered triacs with support for up to 30 VAC and 0.5 amps at 24 VAC.

g. Program Execution

1) Process control loops shall operate in parallel and not in sequence unless specifically required to operate in sequence by the sequence of control.
2) The application shall have the ability to determine if a power cycle to the controller has occurred and the application programmer shall be able to use the indication of a power cycle to modify the sequence of controller immediately following a power cycle.

h. Local Interface

1) The controller shall support the connection of a portable interface device such as a laptop computer or vendor unique hand-held device. Via this local interface, an operator shall be able to:

a) Adjust application parameters.
b) Execute manual control of input and output points.
c) View dynamic data.

7. Application Specific Devices

a. Application specific devices shall have fixed function configurable applications.
b. If the application can be altered by the vendor's application programmable tool, the device is an advanced application controller and not an application specific device.
c. Application specific devices shall be BTL certified

F. DDC SENSORS AND POINT HARDWARD

1. Temperature Sensors

a. Acceptable Manufacturers: Veris Industries
b. All temperature devices shall use precision thermistors accurate to +/- 1 degree F over a range of –30 to 230 degrees F. Space temperature sensors shall be accurate to +/- .5 degrees F over a range of 40 to 100 degrees F.
c. Room Sensor: Standard space sensors shall be available in an [off white] [black] enclosure made of high impact ABS plastic for mounting on a standard electrical box. Basis of Design: Veris TW Series

1) Where manual overrides are required, the sensor housing shall feature both an optional sliding mechanism for adjusting the space temperature setpoint, as well as a push button for selecting after hours operation.
2) Where a local display is specified, the sensor shall incorporate an LCD display for viewing the space temperature, setpoint and other operator selectable parameters. Using built in buttons, operators shall be able to adjust setpoints directly from the sensor.

d. Duct Probe Sensor: Sensing element shall be fully encapsulated in potting material within a stainless steel probe. Useable in air handling applications where the coil or duct area is less than 14 square feet. Basis of Design: Veris TD Series
e. Duct Averaging Sensor: Averaging sensors shall be employed in ducts which are larger than 14 square feet. The averaging sensor tube shall contain at least one thermistor for every 3 feet, with a minimum tube length of 6 feet. The averaging sensor shall be constructed of rigid or flexible copper tubing. Basis of Design: Veris TA Series
f. Outside Air Sensor: Provide the sensing element on the building's north side. Sensing element shall be fully encapsulated in potting material within a stainless steel probe. Probe shall be encased in PVC solar radiation shield and mounted in a weatherproof enclosure. Operating range -40 to 122 F, Basis of Design: Veris TO Series
g. A pneumatic signal shall not be allowed for sensing temperature.

2. Humidity Wall Transmitter

    a. Acceptable Manufacturer: Veris Industries
    b. Transmitters shall be accurate to +/- 2 % at full scale.
    c. Transmitter shall have replaceable sensing element.
    d. Sensor type shall be thin-film capacitive.
    e. Sensor element shall contain multipoint calibration on-board in nonvolatile memory
    f. Operating range shall be 0 - 100% RH noncondensing, 50 to 95 F
    g. Output shall be field selectable 4-20 mA or 0-5/0-10 VDC.
    h. Transmitter shall accept 12-30 VDC or 24 VAC supply power.
    i. Transmitter shall be available in an [off white] [black] enclosure made of high impact ABS plastic for mounting on a standard electrical box.
    j. Transmitter shall have LCD display
    k. Transmitter shall be available with a certification of NIST calibration
    l. Transmitter shall be available with an integrated temperature sensor
    m. Basis of Design: Veris HWL Series

3. Humidity Duct Transmitter

    a. Acceptable Manufacturer: Veris Industries
    b. Transmitters shall be accurate to +/-2 % at full scale.
    c. Transmitter shall be fully encapsulated in potting material within a stainless steel probe.
    d. Transmitter shall have replaceable sensing element.
    e. Sensor type shall be thin-film capacitive.
    f. Sensor element shall contain multipoint calibration on-board in nonvolatile memory
    g. Operating range shall be 0 - 100% RH noncondensing, -40 to 122 F
    h. Output shall be 4-20 mA or 0-5/0-10 VDC.
    i. Transmitter shall accept 12-30 VDC or 24 VAC supply power.
    j. Transmitter shall be available with a certification of NIST calibration
    k. Transmitter shall be available with an integrated temperature sensor
    l. Basis of Design: Veris HD Series

4. Humidity Outdoor Transmitter

    a. Acceptable Manufacturer: Veris Industries
    b. Transmitters shall be accurate to +/- 2% at full scale.
    c. Transmitter shall be fully encapsulated in potting material within a stainless steel probe. Probe shall be encased in PVC solar radiation shield and mounted in a weatherproof enclosure.
    d. Transmitter shall have replaceable sensing element.
    e. Sensor type shall be thin-film capacitive.
    f. Sensor element shall contain multipoint calibration on-board in nonvolatile memory
    g. Operating range shall be 0 - 100% RH noncondensing, -40 to 122 F
    h. Output shall be 4-20 mA or 0-5/0-10 VDC.
    i. Transmitter shall accept 12-30 VDC or 24 VAC supply power.

j. Transmitter shall be available with a certification of NIST calibration
k. Transmitter shall be available with an integrated temperature sensor
l. Basis of Design: Veris HO Series

5. Carbon Dioxide Wall Transmitter

a. Acceptable Manufacturer: Veris Industries
b. Sensor type shall be Non-dispersive infrared (NDIR).
c. Accuracy shall be ±30 ppm ±2% of measured value with annual drift of ±10 ppm. Minimum five year recommended calibration interval.
d. Repeatability shall be ±20 ppm ±1% of measured value
e. Response Time shall be <60 seconds for 90% step change
f. Outputs shall be field selectable [Analog: 4-20mA or 0-5/0-10VDC] [Protocol: Modbus or BACnet] with [SPDT Relay 1A@30VDC] [temperature setpoint slider]
g. Transmitter shall accept 12-30 VDC or 24 VAC supply power.
h. Temperature Range: [32° to 122°F (CO2 only)] [50° to 95°F (with humidity option)]
i. Output range shall be programmable 0-2000 or 0-5000 ppm
j. Transmitter shall be available in an [off white] [black] enclosure for mounting on a standard electrical box.
k. Transmitter shall have LCD display for commissioning and provide additional faceplate to conceal LCD display where occupants may misinterpret CO2 readings.
l. Transmitter shall be available with an integrated [humidity sensor] [temperature sensor]
m. Basis of Design: Veris CWL

6. Carbon Dioxide Duct Transmitter

a. Acceptable Manufacturer: Veris Industries
b. Sensor type shall be Non-dispersive infrared (NDIR).
c. Accuracy shall be ±30 ppm ±2% of measured value with annual drift of ±10 ppm. Minimum five year recommended calibration interval.
d. Repeatability shall be ±20 ppm ±1% of measured value
e. Response Time shall be <60 seconds for 90% step change
f. Outputs shall be field selectable Analog: 4-20mA or 0-5/0-10VDC with SPDT Relay 1A@30VDC
g. Transmitter shall accept 12-30 VDC or 24 VAC supply power.
h. Temperature Range: 32° to 122°F
i. Output range shall be programmable 0-2000 or 0-5000 ppm
j. Enclosure shall not require remote pickup tubes and make use of integrated H-beam probe to channel air flow to sensor.
k. Enclosure lid shall require no screws and make use of snap on features for attachment
l. Enclosure shall be made of high impact ABS plastic
m. Transmitter shall have LCD display
n. Transmitter shall be available with an integrated [humidity sensor] [temperature sensor]
o. Basis of Design: Veris CDL

7. Air Pressure Transmitters

   a. Acceptable Manufacturers: Veris Industries
   b. Sensor shall be microprocessor profiled ceramic capacitive sensing element
   c. Transmitter shall have 14 selectable ranges from 0.1 – 10" WC
   d. Transmitter shall be +/- 1% accurate in each selected range including linearity, repeatability, hysteresis, stability, and temperature compensation.
   e. Transmitter shall be field configurable to mount on wall or duct with static probe
   f. Transmitter shall be field selectable for Unidirectional or Bidirectional
   g. Maximum operating pressure shall be 200% of design pressure.
   h. Output shall be field selectable 4-20 mA or 0-5/0-10 VDC linear.
   i. Transmitter shall accept 12-30 VDC or 24 VAC supply power
   j. Response time shall be field selectable T95 in 20 sec or T95 in 2 sec
   k. Transmitter shall have an LCD display
   l. Units shall be field selectable for WC or PA
   m. Transmitter shall have provision for zeroing by pushbutton or digital input.
   n. Transmitter shall be available with a certification of NIST calibration
   o. Basis of Design: Veris model PXU.

8. Liquid Differential Pressure Transmitters
   a. Acceptable Manufacturer: Veris Industries
   b. Transmitter shall be microprocessor based
   c. Transmitter shall use two independent gauge pressure sensors to measure and calculate differential pressure
   d. Transmitter shall have 4 switch selectable ranges
   e. Transmitter shall have test mode to produce full-scale output automatically.
   f. Transmitter shall have provision for zeroing by pushbutton or digital input.
   g. Transmitter shall have field selectable outputs of 0-5V, 0-10V, and 4-20mA.
   h. Transmitter shall have field selectable electronic surge damping
   i. Transmitter shall have an electronic port swap feature
   j. Transmitter shall accept 12-30 VDC or 24 VAC supply power
   k. Sensor shall be 17-4 PH stainless steel where it contacts the working fluid.
   l. Performance:
   m. Accuracy shall be ±1% F.S. and ±2% F.S. for lowest selectable range
   n. Long term stability shall be ±0.25%
   o. Sensor temperature operating range shall be -4° to 185°F
   p. Operating environment shall be 14° to 131°F; 10-90% RH noncondensing
   q. Proof pressure shall be 2x max. F.S. range
   r. Burst pressure shall be 5x max. F.S. range
   s. Transmitter shall be encased in a NEMA 4 enclosure
   t. Enclosure shall be white powder-coated aluminum
   u. Transmitter shall be available with a certification of NIST calibration
   v. Transmitter shall be available as preinstalled on a bypass valve manifold
   w. Basis of Design: Veris PW

9. Current Sensors

a. Current status switches shall be used to monitor fans, pumps, motors and electrical loads. Current switches shall be available in split core models, and offer either a digital or an analog signal to the automation system. Acceptable manufacturer is Veris Industries

10. Current Status Switches

a. Acceptable Manufacturer: Veris Industries
b. General: Factory programmed current sensor to detect motor undercurrent situations such as belt or coupling loss on constant loads. Sensor shall store motor current as operating parameter in non-volatile memory. Push-button to clear memory.
c. Visual LED indicator for status.
d. Split core sensor, induced powered from monitored load and isolated to 600 VAC rms. Sensor shall indicate status from 0.5 A to 175 A.
e. Normally open current sensor output. 0.1A at 30 VAC/DC.
f. Basis of Design: Veris Model H608.

11. Liquid Flow, Insertion Type Turbine Flowmeter
a. Acceptable Manufacturer: Veris Industries
b. General: Turbine-type insertion flow meter designed for use in pipe sizes 1 1/2" and greater. Available in hot tap configuration with isolation valves and mounting hardware to install or remove the sensor from pipeline that is difficult to shut down or drain
c. Performance:

1) Accuracy ±1% of rate over optimum flow range; ≥10 upstream and ≥5 downstream straight pipe diameters, uninterrupted flow
2) Repeatability ±0.5%
3) Velocity Range: 0.3 to 20 FPS
4) Pressure Drop 0.5 psi or less @ 10 ft/sec for all pipe sizes 1.5" dia and up
5) Pressure Rating: 1000 psi @ 70°F

d. Maximum Temperature Rating: 300°F
e. Materials: Stainless Steel or Brass body; Stainless steel impeller
f. Transmitter:

1) Power Supply: 12 - 30VAC or 8 - 35VDC.

a) Output: [Frequency] [4-20 mA] [Scaled Pulse]

2) Temperature Range: 14° to 150°F
3) Display: 8 character 3/8" LCD (Optional)
4) Enclosure: NEMA 4, Polypropylene with Viton® sealed acrylic cover

g. Basis of Design: Veris SDI series

12. Dampers

a. Automatic dampers, furnished by the Building Automation Contractor shall

be single or multiple blade as required. Dampers are to be installed by the HVAC Contractor under the supervision of the BAS Contractor. All blank-off plates and conversions necessary to install smaller than duct size dampers are the responsibility of the Sheet Metal Contractor.

b. Damper frames are to be constructed of 13 gauge galvanized sheet steel mechanically joined with linkage concealed in the side channel to eliminate noise as friction. Compressible spring stainless steel side seals and acetyl or bronze bearings shall also be provided.
c. Damper blade width shall not exceed eight inches. Seals and 3/8 inch square steel zinc plated pins are required. Blade rotation is to be parallel or opposed as shown on the schedules.
d. For high performance applications, control dampers will meet or exceed the UL Class I leakage rating.
e. Control and smoke dampers shall be Ruskin, or approved equal.
f. Provide opposed blade dampers for modulating applications and parallel blade for two position control.

13. Damper Actuators

a. Damper actuators shall be electronic, and shall be direct coupled over the shaft, without the need for connecting linkage. The actuator shall have electronic overload circuitry to prevent damage. For power-failure/safety applications, an internal mechanical or electrical capacitance type, spring return mechanism shall be built into the actuator housing. Non-spring return actuators shall have an external manual gear release to allow positioning of the damper when the actuator is not powered.

14. Airflow Measuring Stations

a. Provide a thermal anemometer using instrument grade self heated thermistor sensors with thermistor temperature sensors.
b. The flow station shall operate over a range of 0 to 5,000 feet/min with an accuracy of +/- 2% over 500 feet/min and +/- 10 ft/min for reading less than 500 feet/min.

G. ELECTRICAL POWER MEASUREMENT

1. Electrical Power Monitors, Single Point (Easy Install):

a. Acceptable Manufacturer: Veris Industries.
b. General: Consist of three split-core CTs, factory calibrated as a system, hinged at both axes with the electronics embedded inside the master CT. The transducer shall measure true (rms.RMS) power demand real power (kW) consumption (kWh). Conform to ANSI C12.1 metering accuracy standards.
c. Voltage Input: Load capacity as shown on drawings. 208-480 VAC, 60 Hz
d. Maximum Current Input: Up to 2400A
e. Performance:

1) Accuracy: +/- 1% system from 10% to 100% of the rated current

of the CT's

2) Operating Temperature Range: 32-140°F, 122°F for 2400A.

f. Output: 4 to 20 mA, Pulse. or Modbus RTU

g. Ratings:

1) Agency: UL508 or equivalent
2) Transducer internally isolated to 2000 VAC.
3) Case isolation shall be 600 VAC.

h. Basis of Design: Similar to Hawkeye Veris H80xx40 series

i. Accessories: [BACnet] [LON] communications gateway

2. Electrical Power Monitors, Single Point (High Accuracy):

a. Acceptable Manufacturer: Veris Industries.

b. General: Revenue grade meter. Measures voltage, amperage, real power (kW), consumption (kWh), and reactive power (kVARar), and power factor (PF) per phase and total load for a single load. Factory calibrated as a system using split core CT's. Neutral voltage connection is required.

c. Voltage Input: 208-480 VAC, 60 Hz

d. Current Input: Up to 2400A

e. Performance:

1) Accuracy: +/- 1% system from 2% to 100% of the rated current of the CT's
2) Operating Temperature Range: 32-122°F

f. Output: Pulse, BACnet, Modbus RTU

g. Display: Backlit LCD

h. Enclosure: NEMA 1

i. Agency Rating: UL508 or equivalent

j. Basis of Design: Veris Industries H81xx00 series.

3. Electrical Power Monitors, Single Point (High Accuracy/Versatility):

a. Acceptable Manufacturer: Veris Industries.

b. General: Revenue grade meter. Measures voltage, amperage, real power (kW), consumption (kWh), reactive power (kVAR), apparent power (kVA) and power factor (PF) per phase and total load for a single load. Available with data logging , Bi-directional (4-quadrant) metering, and pulse contact accumulator inputs.

c. Voltage Input: 90-600 VAC, 50/60 Hz, 125-300 VDC

d. Current Input: 5A – 32,000A, selectable 1/3V or 1V CT inputs

e. Performance:

1) Accuracy shall be +/- [0.2%] [0.5%] revenue grade
2) Operating Temperature Range: -22-158°F

f. Output shall be [Pulse] [BACnet] [Modbus RTU] [LON]

g. Display: Backlit LCD
h. Enclosure: NEMA 4x optional
i. Agency Rating: UL508, ANSI C12.20
j. Basis of Design: Veris E5xxx series.

4. Electrical Power Monitors, Multiple Point (92 loads, High Accuracy):

a. Acceptable Manufacturer: Veris Industries.
b. General: Revenue grade meter. Measures volts, amps, power and energy for each circuit. 1/4 amp to 200 amp monitoring. 4 configurable alarm threshold registers
c. Voltage Input: 90-277 VAC, 60 Hz
d. Current Input: 5A – 32,000A, 1/3V CT inputs
e. Performance:

1) Accuracy: +/- 0.5% meter (split core), +/- 1% system from 1/4-100A (solid core)
2) Operating Temperature Range: 32-140°F

f. Output: Modbus RTU
g. Agency Rating: UL508, ANSI C12.10, IEC Class 1
h. Basis of Design: Veris E3xxx series.

23 09 00.3 EXECUTION

A. CONTRACTOR RESPONSIBILITIES

1. General

a. Installation of the building automation system shall be performed by the Contractor or a subcontractor. However, all installation shall be under the personal supervision of the Contractor. The Contractor shall certify all work as proper and complete. Under no circumstances shall the design, scheduling, coordination, programming, training, and warranty requirements for the project be delegated to a subcontractor.

2. Code Compliance

a. All wiring shall be installed in accordance with all applicable electrical codes and will comply with equipment manufacturer's recommendations.

3. Cleanup

a. At the completion of the work, all equipment pertinent to this contract shall be checked and thoroughly cleaned, and all other areas shall be cleaned around equipment provided under this contract.

B. WIRING, CONDUIT, AND CABLE

1. All wire will be copper and meet the minimum wire size and insulation class listed below:

Wire Class	Wire Size	Isolation Class
Power	12 Gauge	600 Volt
Class One	14 Gauge Std.	600 Volt
Class Two	Per Mfr.	300 Volt
Class Three	Per Mfr.	300 Volt
Communications	Per Mfr.	Per Mfr.

2. Power and Class One wiring may be run in the same conduit. Class Two and Three wiring and communications wiring may be run in the same conduit.

3. Where different wiring classes terminate within the same enclosure, maintain clearances and install barriers per the National Electric Code.

4. Where wiring is required to be installed in conduit, EMT shall be used. Conduit shall be minimum 1/2 inch galvanized EMT. Set screw fittings are acceptable for dry interior locations. Watertight compression fittings shall be used for exterior locations and interior locations subject to moisture. Provide conduit seal-off fitting where exterior conduits enter the building or between areas of high temperature/moisture differential.

5. Flexible metallic conduit shall be used for connections to motors, actuators, controllers, and sensors mounted on vibration producing equipment. Liquid-tight flexible conduit shall be use in exterior locations and interior locations subject to moisture.

6. Junction boxes shall be provided at all cable splices, equipment termination, and transitions from EMT to flexible conduit. Interior dry location J-boxes shall be galvanized pressed steel, nominal four-inch square with blank cover. Exterior and damp location JH-boxes shall be cast alloy FS boxes with threaded hubs and gasketed covers.

7. Where allowed by code and approved by Engineer and Owner prior to bid, the space above the ceiling is a supply or return air plenum, the wiring shall be plenum rated. Teflon wiring can be run without conduit above suspended ceilings.

8. Fiber optic cable shall include the following sizes; 50/125, 62.5/125 or 100/140.

9. Only glass fiber is acceptable, no plastic.

10. Fiber optic cable shall only be installed and terminated by an experienced contractor. The BAS contractor shall submit to the Engineer the name of the intended contractor of the fiber optic cable with his submittal documents.

C. HARDWARE INSTALLATION

1. Installation Practices for Wiring

2. All controllers are to be mounted per the manufacturer's installation documentation.

3. The 120VAC power wiring to each Ethernet or Remote Site controller shall be a dedicated run, with a separate breaker. Each run will include a separate hot, neutral and ground wire. The ground wire will terminate at the breaker panel ground. This circuit will not feed any other circuit or device.

4. A true earth ground must be available in the building. Do not use a corroded or galvanized pipe, or structural steel.

5. Wires are to be attached to the building proper at regular intervals such that wiring does not droop. Wires are not to be affixed to or supported by pipes, conduit, etc.

6. Conduit in finished areas will be concealed in ceiling cavity spaces, lenums, furred spaces and wall construction. Exception; metallic surface raceway may be used in finished areas on masonry walls. All surface raceway in finished areas must be color matched to the existing finish within the limitations of standard manufactured colors.

7. Conduit, in non-finished areas where possible, will be concealed in ceiling cavity spaces, plenums, furred spaces, and wall construction. Exposed conduit will run parallel to or at right angles to the building structure.

8. Wires are to be kept a minimum of three (3) inches from hot water, steam, or condensate piping.

9. Where sensor wires leave the conduit system, they are to be protected by a plastic insert.

10. Wire will not be allowed to run across telephone equipment areas.

D. INSTALLATION PRACTICES FOR FIELD DEVICES

1. Well-mounted sensors will include thermal conducting compound within the well to insure good heat transfer to the sensor.

2. Actuators will be firmly mounted to give positive movement and linkage will be adjusted to give smooth continuous movement throughout 100 percent of the stroke.

3. Water line mounted sensors shall be removable without shutting down the system in which they are installed.

4. For duct static pressure sensors, the high pressure port shall be connected to a

static pressure probe inserted into the duct. The low pressure port shall be left open to the plenum area at the point that the high pressure port is tapped into the ductwork.

5. For building static pressure sensors, the high pressure port shall be inserted into the space via a static pressure pick-up. Pipe the low pressure port to the outside of the building.

E. ENCLOSURES

1. For all I/O requiring field interface devices, these devices where practical will be mounted in a field interface panel (FIP). The Contractor shall provide an enclosure which protects the device(s) from dust, moisture, conceals integral wiring and moving parts.

2. FIPs shall contain power supplies for sensors, interface relays and contactors, and safety circuits.

3. The FIP enclosure shall be of steel construction with baked enamel finish; NEMA 1 rated.

4. All wiring to and from the FIP will be to screw type terminals or lever nuts. Analog or communications wiring may use the FIP as a raceway without terminating. The use of wire nuts within the FIP is prohibited.

5. All outside mounted enclosures shall meet the NEMA-3R rating.

F. IDENTIFICATION

1. Identify all control wires with labeling tape or sleeves using words, letters, or numbers that can be exactly cross-referenced with as-built drawings.

2. All field enclosures, other than controllers, shall be labeled.

3. Junction box covers will be marked to indicate that they are a part of the BAS system.

4. All I/O field devices (except space sensors) that are not mounted within FIP's shall be labeled.

5. All I/O field devices inside FIP's shall be labeled.

G. CONTROL SYSTEM SWITCH-OVER

1. Demolition of the existing control system will occur after the new temperature control system is in place including new sensors and new field interface devices.

2. Switch-over from the existing control system to the new system will be fully coordinated with the Owner. A representative of the Owner will be on site during switch-over.

3. The Contractor shall minimize control system downtime during switch-over. Sufficient installation mechanics will be on site so that the entire switch-over can be accomplished in a reasonable time frame.

H. LOCATION

1. The location of sensors is per mechanical and architectural drawings.

2. Space humidity or temperature sensors will be mounted away from machinery generating heat, direct light and diffuser air streams.

3. Outdoor air sensors will be mounted on the north building face directly in the outside air. Install these sensors such that the effects of heat radiated from the building or sunlight is minimized.

4. Field enclosures shall be located immediately adjacent to the controller panel(s) to which it is being interfaced.

I. SOFTWARE INSTALLATION

1. The Contractor shall provide all labor necessary to install, initialize, start-up and debug all system software as described in this section. This includes any operating system software or other third party software necessary for successful operation of the system.

J. DATABASE CONFIGURATION

1. The Contractor will provide all labor to configure those portions of the database that are required by the points list and sequence of operation.

K. COLOR GRAPHIC DISPLAYS

1. Unless otherwise directed by the owner, the Contractor will provide color graphic displays as depicted in the mechanical drawings for each system and floor plan. For each system or floor plan, the display shall contain the associated points identified in the point list and allow for setpoint changes as required by the owner.

L. REPORTS

1. The Contractor will configure a minimum of 4 reports for the owner. These reports shall, at a minimum, be able to provide:

   a. Trend comparison data

b. Alarm status and prevalence information
c. System user data

M. POINT TO POINT CHECKOUT

1. Each I/O device (both field mounted as well as those located in FIPs) shall be inspected and verified for proper installation and functionality. A checkout sheet itemizing each device shall be filled out, dated and approved by the Project Manager for submission to the owner or owner's representative.

N. CONTROLLER AND WORKSTATION CHECKOUT

1. A field checkout of all controllers and front end equipment (computers, printers, modems, etc.) shall be conducted to verify proper operation of both hardware and software.

O. SYSTEM ACCEPTANCE TESTING

1. All application software will be verified and compared against the sequences of operation.

2. Control loops will be exercised by inducing a setpoint shift of at least 10% and observing whether the system successfully returns the process variable to setpoint.

3. Test alarms in the system and validate that the system generates the appropriate alarm message, that the message appears at all prescribed destinations (workstations or printers), and that any other related actions occur as defined (i.e. graphic panels are invoked, reports are generated, etc.).

4. erform an operational test of each unique graphic display and report to verify that the item exists, that the appearance and content are correct, and that any special features work as intended.

5. Perform an operational test of each third party interface that has been included as part of the automation system. Verify that all points are properly polled, that alarms have been configured, and that any associated graphics and reports have been completed. If the interface involves a file transfer over Ethernet, test any logic that controls the transmission of the file, and verify the content of the specified information.

23 09 00.4 SEQUENCE

A. VERTICAL WALL MOUNTED HEAT PUMPS

1. Controls, including thermostat, humidistat, etc. shall be provided by the unit manufacturer. Unit shall operate under manufacturer provided controls.

2. Automation system shall interface with unit through a BACnet terminal provided by the equipment manufacturer.

3. BAS shall be able to adjust setpoints and schedule unit operation through the automation system.

4. All available points associated with the unit shall pass to the BAS.

B. SPLIT SYSTEM HEAT PUMPS

1. Provide dedicated controller for each split system heat pump. Provide space mounted temperature sensor (with setpoint adjustment and override). Provide space mounted humidistat adjacent to temp sensor. Device the incorporates both functions into a single sensor is acceptable.

    a. For units over 2000 CFM provide space mounted CO2 sensor.
    b. For units over 2000 CFM provide economizer cycle including outside air, relief air and return air dampers.

2. BAS shall initiate operation in occupied or unoccupied setting as determined by the schedule. In unoccupied mode outside air dampers shall remain closed. In occupied mode damper shall modulate to minimum outside air setting.

3. Unit shall operate to maintain temperature settings as required by cycling heating, cooling or economizer modes.

4. Where CO2 sensor is sapecified, outside air damper shall modulate between max and min settings to maintain setpoint.

5. Interlock with ERV where noted on plans. ERV shall operate under it's internal controls to rotate energy wheel and cycle fans as required. Provide differential pressure sensors to confirm fan operation.

6. Whenever space humidity level exceeds the setpoint and there is no call for cooling, the unit shall go into dehumidification mode. The compressor shall cycle on to provide full cooling. The electric heat shall cycle through a solid state controller to maintain discharge air temperature at 72F (adj through the automation system).

7. Points list

    a. Start/stop/status
    b. Space temperature
    c. Space humidity
    c. CO2 level
    d. Discharge air temperature

C. MISCELLANOUS

1. Provide space mounted sensor to monitor temperature in all space served by a ductless split system. Provide all interlock wiring required for unit operation. Unit shall be provided with a Bacnet interface that allows for monitoring of unit operation and changing setpoints.

2. See fan schedule for control requirements.

DIVISION 23

SECTION 23 20 00: HVAC PIPING

23 20 00.01 GENERAL

A. SCOPE

1. The provisions of Section 23 05 00 apply to all work in this Section.

2. Furnish and install all refrigerant and condensate drain piping as shall be required in order to provide a complete and satisfactory system.

23 20 00.02 PRODUCTS

A. REFRIGERANT PIPING

1. All refrigerant piping shall be Type "K" hard drawn copper of "ACR" tubing with wrought copper sweat fittings. All joints are to be made with hard solder such as "Sil-Fos" or "Silver Solder."

2. All joints in refrigeration pipe work shall be soldered with the use of nitrogen gas. Refrigerant piping shall be tested, evacuated, charged with nitrogen and completely dried before charging with freon.

3. All refrigerant piping underground shall be encased in plastic or PVC conduit.

4. Refrigerant piping shall include best grade brass refrigerant fittings, consisting of expansion valve, solenoid valve, sight glass with moisture indicator, filter dryer, check valves and/or specialties as may be recommended or required by the manufacturer or as shown on the drawings.

B. DRAIN PIPING

1. All drain lines shall be Type "L" hard drawn copper.

23 20 00.03 EXECUTION

A. PIPE AND PIPE FITTINGS

1. Provide all piping and connections to all items of equipment as shown and/or required to fully complete the system indicated, including drains and other connections. The drawings show the arrangement desired and the Contractor shall follow the drawings as accurately as possible. If conflict should arise, the Contractor shall verify all measurements on the job and cut pipe unless specifically noted for expansion loops. All piping shall be reamed or filed and cleaned to remove burrs and other obstructions.

2. The Contractor shall be responsible for installing all piping work in a neat workmanlike manner. This shall be interpreted to mean that all piping shall be neatly aligned, installed and supported in equally spaced parallel runs using trapeze

hangers where applicable, install square, true and plumb with walls, equipment or other related surfaces using standard fittings. Any pipe work installed in a disorderly or unworkmanlike manner as adjudged by the Architect shall be corrected by the Contractor at the Contractor's expense.

B. BLOWING-OUT SYSTEM

1. All piping and equipment shall be thoroughly blown-out under pressure and clean of all foreign matter wasting condensate through temporary connections so long as necessary to thoroughly clean before system is placed in operation. Use every precaution to prevent pipe compound, scale, dirt, welding and other objectionable matter getting into piping system and equipment.

C. HANGERS

1. All piping shall be supported on not less than 10' centers and within 30" of each change of direction except that piping 1-1/4" size and smaller shall be supported on 8'-0" centers.

2. All piping shall be hung by means of split type wrought iron hanger rings similar to Grinnell Figure 104 except as otherwise noted. Copper piping not insulated shall be hung from copper plated hangers similar to Figure CT-97. All insulated piping shall be hung by means of clevis type hangers sized to fit outside of insulation, Grinnell Figure 260.

3. Pipe hangers shall be supported by means of iron hanger rods from the building construction or from structural steel members, and in an approved manner. Where required, piping shall be hung from angle iron slips or suitable brackets attached to sides of masonry construction.

4. All insulated piping shall be provided with insulating protection sheet metal saddles. These shall be 20 gauge galvanized iron. Saddles shall be of a length equal to two times the outside diameter of the insulation and shall extend to above the center line of the pipe.

5. Spring type isolators and wood blocking under insulation jacket shall be provided at large piping subject to vibrations as indicated in the plans and details. Contractor shall provide spring isolator submittal indicating construction, spacing, loading and efficiency.

6. Where piping passes through masonry construction, steel pipe sleeves shall be provided, sized to allow at least 1/2" clearance around pipe or insulation where pipe is insulated. Sleeves shall be flush with finished walls and extend 1/2" above finish floors. A watertight seal shall be provided between floor and sleeve and space between pipe and sleeve shall be caulked with lead wool.

DIVISION 23

SECTION 23 30 00 AIR DISTRIBUTION

23 30 00.01 GENERAL

A. SCOPE

1. Furnish and install all sheet metal work shown or called for including ductwork and connections to fans and equipment.

2. Ductwork shall be provided and installed as shown on the drawings. All details of ductwork are not indicated, and necessary bends, offsets and transformation must be furnished whether shown or not.

3. The provisions of Section 23 05 00 apply to all the work in this Section.

B. SUBMITTALS Submit the following in accordance with Section 23 05 00:

1. Manufacturer's cuts.

2. Certified capacity ratings.

3. Installation instructions.

C. RELATED DOCUMENTS

1. Section 23 07 00 - Insulation.

23 30 00.02 PRODUCTS

A. GENERAL

1. All ductwork, plenums and casings shall be constructed of sheet metal, as herein specified. All sheet metal construction shall conform to the pressure classification shown on the contract drawings, or herein specified and shall be in accordance with the construction and installation details in Chapter 19 of the 2012 ASHRAE Systems and Equipment Handbook or the appropriate SMACNA Standards.

2. Duct sizes on drawings represent gross sheet metal dimensions. Allowance has been made, where applicable, for duct liner.

B. LOW PRESSURE DUCTWORK

1. Low pressure ductwork shall be constructed of zinc coated sheet steel and shall conform to the 2nd Edition of SMACNA HVAC Duct Construction Standards -Metal and Flexible, 1995, as follows:

a. Rectangular Duct:

1) 1" w.g. pressure class - Table 1-4.

b. Round Duct:

1) 2" w.g. pressure class - Table 3-2A.

C. GENERAL EXHAUST DUCTWORK

1. Unless otherwise noted, all exhaust ductwork shall be constructed the same as specified for low pressure ductwork.

D. KITCHEN EXHAUST DUCTWORK

1. Kitchen exhaust duct shall be constructed of carbon steel or in stainless steel in accordance with NFPA Standard No. 96. All seams and joints shall have a liquid tight continuous external weld. Dishwasher exhaust duct shall be stainless steel.

E. EXPOSED DUCTWORK

1. Where round or flat oval ductwork is called for on plans, it shall be prefabricated spiral lock seam conduit with prefabricated fittings as manufactured by United Sheet Metal Co., Inc. or equal.

2. Construction shall be an airtight, outer pressure shell, a l" insulation layer, and a perforated metal inner liner that completely covers the insulation throughout the system. The outer shell shall be manufactured from galvanized steel meeting ASTM A-517-67.

3. Fittings shall be manufactured to published standards for dimensions and construction details. Installation manuals shall be supplied to the Contractor to provide detailed instructions on methods and procedures for assembly.

4. All seams in the pressure shell of all fittings are to be continuously welded. Galvanized areas that have been damaged by welding shall be coated with corrosion resistant aluminum paint.

5. Inner liners of both duct and fittings are to be adequately supported by metal spacers welded in position to maintain spacing and concentricity.

6. Provide an inner coupling to align the inner lining to maintain good air flow conditions equivalent to standard round high pressure duct joints.

7. Openings shall be factory cut and framed for the grille mounting bracket and the framing shall not have excessive welding that will be noticeable beyond the grille frame.

8. All exposed duct shall be mill phosphatized so as to accept painting by the General Contractor.

9. 90 degrees elbows shall be 5 piece gored elbows.

10. All joints shall be sealed using Benjamin Foster 30-02 sealed between screwed metal seams banded with fiberglass tape.

F. FLEXIBLE DUCTWORK

1. Flexible air duct for connections between low pressure duct to diffusers shall be equal to Thermaflex M-KE. Duct shall be listed by Underwriter's Laboratories under UL 181 standards as Class 1 flexible air duct material and shall comply with NFPA Standards 90A and 90B. Duct shall be rated to operate at pressures up to 6" w.g. for sizes 10" and 4" w.g. for sizes 12" and above. Maximum length of flexible air duct shall be 6 feet.

2. Duct shall be a factory fabricated assembly composed of a polymeric liner duct bonded permanently to a coated spring steel wire helix and supporting a fiberglass insulating blanket. Outer vapor barrier shall be of fiberglass reinforced film laminate. Connections shall be made with Thermaflex, or equal, duct straps.

G. FIRE DAMPERS

1. Furnish and install, at locations shown on plans, or where required by code, fire dampers constructed and tested in accordance with UL Safety Standard 555. Each fire damper shall have 1-1/2 hour fire protection rating. In addition each fire damper shall include a 212^{o}F fusible link, and shall include a UL label in accordance with established UL labeling procedures. Damper manufacturer's literature submitted for approval prior to installation shall include comprehensive performance data developed from testing in accordance with AMCA Standard 500 and shall illustrate pressure drops for all sizes of dampers required at all anticipated airflow rates. Fire dampers shall be equipped for vertical or horizontal installation as required by the location shown. Fire dampers required by the location shown. Fire dampers shall be installed in wall and floor openings utilizing steel sleeves, angles, other materials and practices required to provide an installation equivalent to that utilized by the manufacturer when dampers were tested at UL. Installation shall be in accordance with the damper manufacturer's instructions. Fire dampers shall be style "A", "B" or "C" as required.

H. SMOKE DAMPERS

1. Furnish and install at locations shown on plans, or as described in schedules, smoke dampers meeting or exceeding the following specifications.

2. Each damper shall be classified by Underwriters Laboratories as a Leakage Rated Damper for use in Smoke Control Systems under the September, 1983, or latest version of UL Standard 555S and shall bear a UL label attesting to the same.

3. Damper manufacturer shall have tested and qualified a complete range of damper sizes covering all smoke dampers required by this specification. Leakage ratings shall be comparable with, or better than, that listed herein.

4. Smoke dampers and their operators shall be qualified under UL444A to a minimum elevated temperature of 250 degrees F. Appropriate electric operators shall be installed by the damper manufacturer at time of damper fabrication. Damper shall be equal to Ruskin Model SD50 qualified to Leakage Class 1, or SDRS25 qualified to Leakage Class 1, as required.

I. COMBINATION FIRE/SMOKE DAMPERS

1. Furnish and install at locations shown on plans, or as described in schedules,

combination fire smoke dampers meeting or exceeding the following specifications. Frame shall be a minimum of 16 gage (1.52) galvanized steel formed into a structural hat channel shape with tabbed corners for specifications. Frame shall be a minimum of 16 gage (1.52) galvanized steel formed into a structural hat channel shape with tabbed corners for reinforcement. Bearings shall be stainless steel sleeve turning in an extruded hole in the frame. The blades shall be airfoil shaped double skin construction with 14 (1.90) gage equivalent thickness. Blade edge seals shall be silicone rubber and galvanized steel mechanically locked in blade edge (adhesive or clip fastened seals not acceptable) and shall withstand 450oF. Jamb seals shall be stainless steel flexible metal compression type. Blade action must be parallel blade or opposed as shown on the schedule.

2. Each combination fire smoke damper shall be 1-1/2 hour fire rated under UL Standard 555, and shall further be classified by Underwriters Laboratories as a Leakage Rated Damper for use in smoke control systems under the latest version of UL555S, and bear a UL label attesting to same. Damper manufacturer shall have tested, and qualified with UL, a complete range of damper sizes covering all dampers required by this specification. Testing and UL qualifying a single damper size is not acceptable. The leakage rating under UL555S shall be no higher than leakage class 1 (4 cfm/ft. a 1" w.g. and 8 cfm/ft. at 4" w.g. or .02 m3/s/m2 at 249 Pa or .04 m3/s/m2 at 996 Pa). As part of the UL qualification, dampers shall have demonstrated a capacity to operate (to open and close) under HVAC system operating conditions, with pressures of at least 4" w.g. (996 Pa) in the closed position, and 4000 fpm (20.32m/s) air velocity in the open position.

3. In addition to the leakage ratings already specified herein, the combination fire smoke dampers and their actuators shall be qualified under UL555S to an elevated temperature of 250oF, depending upon the actuator. Appropriate electric actuators shall be installed by the damper manufacturer at time of damper fabrication. Damper and actuator shall be supplied as a single entity which meets all applicable UL555 and UL555S qualifications for both dampers and actuators. Manufacturer shall provide factory assembled sleeve of 16" (406) minimum length (contractor to verify requirement). Factory supplied caulked sleeve shall be 20 gage (.91) for dampers through 84" (2134) wide and 18 gage (1.21) above 84" (2134) wide. Damper and actuator assembly shall be factory cycled 10 times to assure operation.

4. Fusible Link. Each combination fire smoke damper shall be equipped with a fusible link which shall melt at (specifier select one) 165oF (74oC) causing damper to close and lock in a closed position.

J. ACCESS DOORS

1. Ventifabrics, Krueger or Duro-Dyne, (Min. 12" x 10" - use 16" x 12" where size permits) insulated doors shall be provided for fire dampers, control dampers, smoke dampers, smoke detectors, and other locations where shown. Door shall be minimum 24 gauge galvanized, double construction with 1" insulation complete collar mounting frame, steel butt hinges, felt gaskets, fasteners and handles. Doors shall be labeled as to function, (fire damper, smoke detector, etc.).

K. TURNING VANES

1. Turning vanes and Deflector Controls, Barber-Colman, Carnes Corporation, Kruger or Titus in length up to 18"; Aero-Dyne Duro-Dyne, or Airsan double thickness about

24" in length, installed in rails.

L. FLEXIBLE CONNECTIONS

1. Flexible duct connections shall be provided where ductwork connects to equipment; ventifabrics or Duro-Dyne 28 ounce minimum waterproof and fire retardant woven glass fabric double coated with neoprene, approved by UL. Maximum length of flexible connections shall be 10 inches.

M. MANUAL AND MOTOR OPERATED DAMPERS

1. American Warming and Ventilating Company Type DAA-P-50, opposed blade, constructed with 15 gauge steel blades. Manual dampers shall be provided with Ventlock No. 637 hand operated locking quadrants located outside of ducts. Locking quadrants shall be elevated 1-1/2" for insulation. Manual dampers 18" x 10" or smaller may be single blade type construction of 16 gauge galvanized sheet metal. Dampers of Ruskin, Krueger, Louvers and Dampers, or Advanced Air, Inc. will be acceptable.

N. SPLITTER DAMPERS

1. Install where shown and at duct splits; provide with Ventlock No. 690 self-locking device; constructed of 16 gauge galvanized steel with hemmed leading edge and reinforced at hinged side.

O. GRILLES, REGISTERS AND DIFFUSERS

1. Grilles, registers and diffusers shall be of the type, size and design as shown on the drawings and/or as specified below. Grilles within the same room or areas shall be of the same type and style to provide architectural uniformity.

2. Each supply, return and exhaust device shall be of the proper design as indicated to handle quantities of air within the space with maximum diffusion and without objectionable air movement or noise level.

3. Each supply outlet and register shall have a volume damper control operable from the front of the device with removable key. Where indicated on the drawings, all side wall registers shall be equipped with deflectors.

23 30 00.03 EXECUTION

A. DUCTWORK

1. All ductwork shall be provided in a neat workmanlike manner. The ducts shall be properly braced and reinforced. All slip joints shall be made in the direction of flow. All ducts shall be true to the dimension indicated and shall be straight and smooth on the inside with neatly finished airtight joints. The ducts shall be securely anchored into the building construction in an approved manner and shall be completely free from vibration under all conditions of operation. All supply, return fresh-air and exhaust systems shall be completely balanced.

2. No duct transformation shall be of a ratio less than four to one and where possible,

shall be of a ratio of six to one. No less than three vertical splitters shall be provided where these ratios cannot be met. No elbow shall have a throat center line radius of less that one and one-half times the duct width at the turn. All turns of less than this amount in rectangular duct shall be provided with duct turning vanes of standard design. Splitters or multi-blade volume dampers, where indicated, shall be provided in all branch.

3. Turning vanes shall be provided at all tees and square elbows. Turning vanes shall be factory fabricated and designed in accordance with the SMACNA or ASHRAE Guide for formed vanes. The first set of turning vanes on the leaving side of fans shall be of the acoustical type to aid in the elimination of unit noise with the exception of room fan coil units.

4. Splitter dampers and volume extractors shall be provided in all low velocity ductwork for proper air distribution. Each damper shall be provided, lubricated bearings at both ends of the shafts, adjustments quadrant, and locking devices and shall be constructed of galvanized iron or steel sheet one gauge heavier than the duct in which they are installed. Access doors shall be located at all splitter dampers.

5. Handholes of not less than 6" x 6" shall be provided at all points where access is required. Manholes of not less than 18" x 24" shall be provided at all points where it is necessary to clean or remove parts of equipment. All access doors and handholes shall be rubber gasketed insulated type with frame and latches.

6. Install access doors at each fire damper, and smoke detector. Label all access doors.

7. All ductwork must be sealed in accordance with Seal Class C as defined in SMACNA HVAC Duct Construction Standards - Metal and Flexible, 1995.

8. All joints and seams in ductwork exposed to weather shall be sealed watertight with a suitable non-aging sealer.

B. KITCHEN EXHAUST DUCTS

1. All ducts should lead, as directly as possible, to the exterior of the building and shall be installed without forming dips or traps which might collect residues.

2. An opening shall be provided at each change of direction for purpose of inspection and cleaning. Openings shall be at the sides and large enough to permit cleaning. In horizontal sections the lower edge of the opening shall be not less than 1-1/2" from the bottom of the duct. Horizontal sections shall be sloped a minimum of 1" per foot. Covers shall be constructed of the same material and thickness as the duct and shall be grease tight when in place.

3. A residue trap shall be provided at the base of each vertical riser with provisions for cleanout.

C. DUCT HANGERS AND SUPPORTS

1. Duct hangers and supports shall conform to those shown in Tables 4-1 and 4-2 of SMACNA HVAC Ductwork 1985, 1st Edition.

D. WALL PENETRATIONS

1. Where ducts pass through non-rated walls and is exposed to view the duct shall be finished with suitable metal collar.

2. Where ducts pass through one hour fire walls, provide not less than 1/2" clearance between the duct and combustible material. Seal the clearance space with non-combustible material retained, and the duct secured in place by steel collars of a gauge equivalent to that of the duct and fastened to both the duct and the enclosure.

3. Where fire dampers are shown or required, dampers shall be installed per manufacturer's UL listing.

E. CLEANING DUCT SYSTEMS

1. Before fan systems are put in operation, vacuum clean inside of air units, plenums and apparatus housing. Filters are to be installed before moving air through duct systems.

DIVISION 23

SECTION 23 34 00: FANS

23 23 00.01 GENERAL

A. SCOPE

1. The provisions of Section 23 05 00 apply to all the work in this Section.

2. Furnish and install fans as required to provide a complete and satisfactory job.

B. SUBMITTALS Submit the following in accordance with Section 23 05 00:

1. Manufacturer's cuts.

2. Certified capacity ratings.

3. Installation instructions.

4. Operating and Maintenance Instructions.

23 23 00.02 PRODUCTS

A. IN-LINE FANS - DIRECT DRIVE

1. Supply or exhaust fans shall be direct driven in-line type. The square fan housing shall be four sides of heavy gauge galvanized steel. One of the sides shall be hinged and shall support the motor and wheel assembly allowing the assembly to swing out for cleaning, inspection, or service without dismantling the unit in any way. The motor shall be isolated from the air stream by a motor enclosure and shall draw cooling air from outside the fan housing.

2. The fan inlet shall be spun venturi throat overlapped by a backward curved centrifugal wheel with spun cone for maximum performance.

3. Fans shall be internally insulated with 1" thick duct liner.

4. Air and sound shall be AMCA licensed.

B. IN-LINE FANS - BELT DRIVE

1. Supply or exhaust fans shall be belt driven in-line type. The square shaped fan housing shall be of heavy gauge galvanized steel. One of the sides shall be hinged and shall support the entire drive assembly and wheel allowing the assembly to swing out for cleaning, inspection, or service without dismantling the unit in any way. The motor shall be mounted on the hinged side exterior isolated from the airstream. The belt and pillow block ball bearings shall be protected from the airstream by an enclosure. The shaft shall be keyed to both the wheel and pulley.

2. The fan inlet shall be a spun venturi throat overlapped by a backward curved centrifugal wheel with spun cone for maximum performance.

3. Fans shall be internally insulated with 1" thick duct liner.

4. Air and sound shall be AMCA licensed.

C. CEILING EXHAUST FAN

1. Type: The fan shall have a forward curved centrifugal wheel.

2. Housing: The fan housing shall be constructed of heavy gauge galvanized steel. The housing interior shall be acoustically lined with 1/2" thick insulation. The discharge outlet shall be adaptable for horizontal or vertical mounting.

3. Motor: The motor shall be mounted on resilient elastic grommets.

D. ROOF MOUNTED CENTRIFUGAL EXHAUST FANS

1. Roof exhaust fans shall be of the centrifugal, belt driven or direct driven type. Construction of the fan housing shall be of heavy gauge aluminum mounted upon a rigid support structure which affords minimal resistance to airflow and noise generation. The fan wheel and inlet cone shall be aluminum and of the high performance, centrifugal blower type. Wheels shall overlap the spun inlet venturi for maximum performance. Wheels shall be statically and dynamically balanced to assure smooth and vibration-free operation. Entire drive assembly shall be mounted on vibration isolators.

2. Motor and drives shall be isolated from the exhaust airstream. Air for cooling the motor shall be taken into the motor compartment from a location free from discharge contaminants. Motors shall be of the heavy duty type with permanently lubricated, sealed ball bearings.

3. The entire drive assembly and wheel, as a unit, shall be removable through the support structure without dismantling the fan housing. The wheel shaft shall be mounted in heavy duty, permanently sealed pillow block ball bearings. Belt drives shall be sized for a minimum of 165% of driven horsepower. Pulleys shall be of the fully machined cast iron type, keyed and securely attached to the wheel and motor shafts. The motor pulleys shall be adjustable for final system balancing.

4. All fans shall bear the AMCA Certified Performance Seal for both air and sound performance.

5. Motor. The motor shall be of a standard type that is easily replaceable and may be either sleeve or ball bearing type. Maximum RPM of the motor shall be l750 RPM.

6. Wire Guard. The inlet side of the fan shall be provided with a wire guard which completely surrounds the fan blades.

7. Shutter. Gravity type.

8. Control. The fan shall be controlled as shown on the drawings.

23 23 00.03 EXECUTION

A. INSTALLATION

1. Fans shall be installed in accordance with manufacturers installation instructions.

DIVISION 23

SECTION 23 72 00: ENERGY RECOVERY UNITS

23 72 00.01 GENERAL

A. SCOPE

1. The provisions of Section 23 05 00 apply to all the work in this Section.

2. Provide where indicated make-up air handling units consisting of supply air fan, exhaust air fan, and heat exchanger wheel.

3. Units shall be packaged units, factory assembled and wired with a single point electrical connection. Where noted on drawings, units for roof top installation shall be rated for use and provided with curbs and all other necessary provisions for roof installation.

4. Units shall be manufactured by one firm with a minimum of five (5) years continuous experience in the building of energy recovery units and shall be regularly engaged in the manufacture of total energy recovery equipment of the types and capacities that are similar to the required equipment.

B. SUBMITTALS

1. Submit the following in accordance with Section 23 72 00.

   a. Submit drawings indicating components, assembly, dimensions, weights, required clearances, location and size of field connections.
   b. Submit product data indicating capacities, weights, specialties and accessories, electrical requirements and wiring diagram.
   c. Submit schedule of equipment typically indicating sizes and number of units, including capacity data.
   d. Submit Manufacturer's Installation Instructions. Indicate rigging, assembly, and installation instructions.

C. OPERATION AND MAINTENANCE DATA

1. Submit operation and maintenance data.

2. Include manufacturer's descriptive literature, operating instructions, maintenance instructions and unit parts.

D WARRANTY

1. Provide one year manufacturer's warranty from date of Owners acceptance.

23 72 00.02 PRODUCTS

A. PACKAGED ENERGY RECOVERY VENTILATOR UNIT

1. Units

   a. Units shall be completely factory assembled. Exhaust fan section, supply fan section, enthalpy wheel section, and filter section, shall have double wall insulated construction. Units shall include a lightweight polymer enthalpy wheel with a permanently bonded silica gel desiccant coating. The wheel design shall consist of removable segments mounted in a stainless steel rotor and laminar flow. Blowers shall be quiet running, FC type and shall enable independent balancing of exhaust and supply airflows by providing separate motors for exhaust and supply airflows by providing separate motors for exhaust and supply blowers with adjustable sheaves. All internal electrical components shall be pre-wired for single point power connection. Weatherproof fused disconnect and motor starters shall be factory mounted and wired.
   b. All units shall bear NRTL safety listing.
   c. Unit electrical components shall be U.L. listed and shall bear the U.L. label. Energy transfer ratings shall be in accordance with ASHRAE Standard 84. Blowers shall bear the AMCA Certified Rating Seals for air performance.
   d. Unit shall be provided with Bacnet interface to allow for integration into the building automation system. Fans shall be capable of starting and stopping independently of each other and the wheel shall be capable of slowing rotation during “economizer” operation. See 15900 for further clarification.

2. Cabinet

   a. Casing shall be constructed of heavy gauge double wall galvanized steel with the exterior painted for further corrosion protection.
   b. Insulation shall be 1" thick - 1.5 LB per cubic foot fiberglass located between the unit's inner and outer walls providing effective acoustical and thermal control, fire safety, and resistance to air erosion.
   c. All components shall be easily accessible through hinged access doors for both exhaust and supply compartments. The energy recovery cassette shall be mounted in a slide-out track for ease of inspection, removal, cleaning, and repair.
   d. Intake hoods shall be standard on all outdoor units and come equipped with one-thick moisture eliminators that also double as an outdoor air pre-filter.
   e. Exhaust hoods shall be standard on all outdoor units and come complete with bird screen over the exhaust opening.
   f. All units shall be supplied with filter racks for two inch thick pleated filters for the outside air and one set of throw away filters shall be included as standard. Filter racks and filters for the exhaust air are optional.

3. Supply/Exhaust Fans

a. Fan wheels shall be double width double inlet forward curved centrifugal types. They shall be statically and dynamically balanced for smooth quiet operation.
b. The housing shall be constructed of heavy gauge steel with die-formed inlet cones. The bearings shall be self aligning, permanently lubricated, sealed ball bearing pillow blocks that are rubber mounted and shall provide dependable fan operation for an average life of 100,000 hours.
c. The fan shaft shall be solid ground and polished cold rolled steel designed such that its operating speed is below its first critical speed.

4. Motors and Drives

a. Motors and drives shall be belt drive, standard duty, 1725 (1800) RPM, open drip proof with resilient mount. All motors are to be thermally protected and shall include automatic reset. Motors shall be permanently lubricated, heavy duty types, matched to the fan load, and furnished at the specified voltage, phase, and enclosure.
b. Drives shall be of the V-belt types. Variable pitch motor sheaves are to be furnished for ease and accuracy in balancing the system and adjusting the required air volume. The blower sheave shall be cast iron single groove with a split tapered bushing that is keyed to the blower shaft.

5. Filters

a. Filters are to be 2" thick pleated media type. They shall be center loading with 25% efficiency. The filters shall be included in the units as an integral part of the cabinet with easy access provided by the manufacturer.

23 72 00.03 EXECUTION

A. EXAMINATION

1. Verify that space is ready for installation of units and openings areas indicated on submittal drawings.

2. Verify that proper power supply is available.

B. INSTALLATION

1. Install in accordance with manufacturer's instructions.

2. Install devices furnished by manufacturer but not factory mounted.

DIVISION 23

SECTION 23 81 19: VERTICAL EXTERIOR HEAT PUMP

23 81 19.01 GENERAL

A. SCOPE

1. The provisions of Section 23 05 00 apply to all the work in this Section.

2. Furnish and install vertical air to air exterior mounted heat pumps as required to provide a complete and satisfactory job.

B. SUBMITTALS. Submit the following in accordance with Section 23 05 00:

1 Manufacturer's Cuts.

2 Certified Capacity Ratings.

3. Installation Instructions.

4. Operating and Maintenance Instructions.

23 81 19.02 PRODUCTS

A. GENERAL

1. The Heat Pump Equipment Supplier is responsible for all work under this Section as stated or modified below

2. The Heat Pump Supplier will furnish dimensioned rough-in drawings for electrical, plumbing, and HVAC hook-up within thirty (30) days after Notice to Proceed.

3. Furnish and install a self-contained, vertical, floor standing, interior mount, thru-the-wall, heat pump to be manufactured by Bard Manufacturing Company, Inc. The unit shall be approved and listed by Intertek ETL Listed (ETL US/C). Unit shall be factory assembled, pre-charged, pre-wired, tested and ready to operate. Unit performance shall be certified in accordance with the Air Conditioning Heating and Refrigeration Institute (AHRI) Standard 390-2003 for Single Package Vertical Units (SPVU). Unit efficiency shall be specified in terms of EER, IPLV, and COP.

4. Unit shall include 5-year parts warranty covering compressor, and 5-year warranty covering parts, heat exchange coils, ventilation packages, subject to terms and conditions of Bard Limited Warranty agreement. No labor is included in Bard warranty. 5 and 5 warranty shall be provided for all SPVU equipment.

5. Manufacturers: Capacities shall be as indicated on drawings and units shall be manufactured by Bard Manufacturing Company, Inc. or approved equal based on pre-approval of submittal.

B. CONSTRUCTION

1. Unit shall be constructed of 20 gauge pre-painted steel exterior finish. Exterior panels shall be of double wall construction. No screws shall be exposed on the exterior panels. Color options available for selection by Architect:

   a. Beige – Painted Steel Finish
   b. Gray – Painted Steel Finish
   c. White – Painted Steel Finish

2. Front panel shall be hinged and lockable for filter service and access to primary functional electrical controls. Front and side panels shall be easily removable for separation of top and bottom sections. Back of unit shall be painted in neutral color to reduce visibility from outdoors.

3. Exterior panels shall be easily removable, and cabinet shall consist of two modules, easily separated by removing 4 bolts, with fork slots allowing for modules to be separated. One module shall contain complete sealed refrigeration system and one module shall contain the ventilation system. Each module shall pass thru standard door frame, and into standard sized elevator doors without tilting or laying equipment down.

4. No fiberglass insulation shall be exposed to the airstream. Exterior cabinet components shall consist of double wall construction with insulation between panels.

5. Unit shall be suitable for right or left hand corner installation without modification. No clearance is required. All service access shall be thru the front of the unit. Side supply air grilles on air distribution box shall include adjustable opposed dampers to limit airflow in corner installations.

C. COMPRESSORS

1. Units shall use a high efficiency 2-stage scroll compressor for maximum efficiency and reliability. Equipment shall be designed to provide 2 stages of cooling and reverse cycle heating. The compressor shall be covered by a 5-year parts warranty. The refrigeration circuit shall be equipped with factory installed high and low pressure controls, liquid line filter dryer, and discharge muffler.

2. Modulating low ambient control to 20 degrees shall be factory installed.

3. The compressor shall be mounted on double floating isolation mounting system and be fitted with factory installed sound attenuation jacket.

4. The refrigeration control shall be a factory installed TXV. Heating and cooling TXV shall be provided. Refrigerant shall be R-410A.

D. CONDENSATE DRAIN SYSTEM

1. Condensate shall be removed from the unit by connections located in the back of the unit. Both indoor and outdoor coil drain pans shall be constructed of non corrosive materials and shall not allow standing water in the drain pan. A condensate overflow protection system shall monitor both drain pans and shut down system to prevent condensate overflow. Two condensate drain connections are manifolded together providing for either right or left access. The I-tec does not

require a trap. The lower rear portion of the cabinet provides room for P trap if required.

E. FANS

1. The condenser fan motor shall be variable speed ECM, allowing for modulating low ambient control and low sound performance.

2. The indoor blower motor shall be a variable speed (ECM) type to produce the same rated air flow from 0 to .5 inch WC of external static pressure at low sound levels. The motor is to be self adjusting to provide proper rated air flow at high static pressures without user adjustment or wiring changes by the user. The motor shall be programmed for 20-second ramp up and 60-second down rate for quiet, smooth starting and stopping. PSC motor shall not be acceptable. Motor shall automatically adjust to proper blower speed:

   a. Ventilation, stage 1 cooling or heating operation, stage 2 cooling or heating operation. Submittals shall include rated cfm for high speed, low speed, and ventilation speed.

F. ELECTRICAL COMPONENTS

1. Electrical components are easily accessible for routine inspection and maintenance through front service panels. Circuit breaker is standard on all 208/230 volt models and toggle disconnect standard on all 460 volt models. Circuit breaker/toggle disconnect access is through lockable access panel. Lock and key are provided with each unit. Unit shall have single point entry for line voltage. Electrical component access point shall be located at standard eye level to allow easy serviceability

G. CONTROL CIRCUIT

1. The internal control circuit shall consist of a current limiting 24 VAC type 75 VA transformers with circuit breaker. The defrost circuit shall consist of a solid state electronic heat pump control. A 90-minute timer shall initiate a defrost cycle if the outdoor coil temperature indicates the possibility of an iced condition. The thermistor sensor, speed-up terminal for service, and a ten-minute defrost override shall be all be standard on the electronic heat pump control. To prevent rapid compressor short cycling, a five-minute time delay circuit shall be incorporated into the heat pump control board. A low pressure bypass shall be incorporated into the heat pump control board to prevent nuisance tripping during low temperature start-up.

2. All units with 3-phase power shall include factory mounted phase rotation monitor. This device shall protect scroll compressor from reverse rotation and also protect unit from phase failure. If 3-phase power is incorrectly connected at the field power connections, the phase monitor shall lock out the unit and a red light will illuminate indicating incorrect phase. Also if a power leg is lost, the phase monitor will lockout the unit due to phase imbalance. Once the condition is corrected, turning the power off at the circuit breaker or disconnect will reset the phase monitor.

H. ELECTRIC HEAT

1. The heat pump shall have a factory installed electric resistance heater available that is designed specifically for application in the I-TEC Series heat pump. Heater shall include automatic limit safety controls.

I. VENTILATION

1. Unit shall provide independent control of ventilation air with a dedicated low voltage ventilation terminal connection. Operation of supply air fan shall be required for ventilation operation.

2. The Energy Recovery Ventilator (ERV) shall consist of 2 rotary wheels in an insulated cassette frame with seals, drive motor and belt. The ERV assembly shall also include intake and exhaust blowers. The total energy wheel shall be coated with silica gel desiccant, permanently bonded without the use of binders or adhesives. The coated segments shall be washable with detergent or alkaline coil cleaner and water. Desiccant shall not dissolve or deliquesce in the presence of water or high humidity. All diameter and perimeter seals shall be provided as part of the cassette assembly and shall be factory set. Drive belts shall not require external tensioners or adjustment. Cassette wheels shall include rims to prevent belts from slipping off wheels. Intake and exhaust airflow can be modulating mode (requires CO2 controller with 2-10vdc output) or can be demand control fixed mode On/Off using relay output from CO2 controller. In fixed mode the intake and exhaust rates are individually adjustable, and can be set to maintain positive pressure if desired. The ERV cassette including parts and media shall include 5-year warranty subject to terms and conditions of Bard's warranty.

3. The ERV thermal performance shall be certified by the manufacturer in accordance with ASHRAE Standard 84, Method of Testing Air-to-Air Heat Exchangers and ARI Standard 1060, Rating for Air-to-Air Energy Recovery Ventilation Equipment Cassettes, and shall be listed in the ARI Certified Products. Unit complies with ANSI/ASHRAE Standard 62.1 Ventilation for Acceptable Air Quality.

J. FILTER

1. 2" pleated MERV 13

K. DEHUMIDIFICATION CYCLE

1. The dehumidification circuit shall incorporate an independent DX coil in the supply air stream in addition to the standard evaporator coil. This coil shall be mounted in the reheat position, and sized to nominally match the sensible cooling capacity of the evaporator coil. Extended run times in dehumidification mode can be achieved using waste heat from the refrigeration cycle to achieve the reheat process, Models that also have electric heaters installed shall have the electric heat inhibited during dehumidification mode, unless a call for emergency heat is initiated.

2. The dehumidification cycle shall be energized by a rise in relative humidity above set point. The unit shall energize in the cooling mode and also a two position valve will energize, allowing hot refrigerant gas to pass thru the reheat coil, reheating the cold air leaving the evaporator coil. The dehumidification cycle shall have on/off capability. If the thermostat calls for cooling or heating during the dehumidification cycle, the unit shall terminate dehumidification to satisfy the call

from the thermostat. A solid state circuit board shall control the dehumidification function. The dehumidification option shall be factory installed only.

L. COILS

1. Evaporator coil shall be constructed of hydrophilic fin stock (green) providing acrylic coating with no bead-up condensate, lower wet coil pressure drop and improved draining and reduced re-entrainment of moisture back into the air stream. Acrylic coating shall also provide antimicrobial properties providing resistance to microbial and fungicidal growth. Coil coating shall meet ASTM D2372- no growth.

2. Condenser coil shall be constructed of aluminum fin stock and copper tube.

M. CONTROLS

1. CompleteStat THO (Temp. Humidity, Occupancy) and Ethernet/Bacnet capability for integration into the building automation system. See section 15900 for further clarification.

N. ACCESSORIES

1. Wall sleeve shall be factory supplied and must be constructed of galvanized steel, coated with an epoxy primer and baked-on polyester enamel paint. It shall be designed to withstand a minimum of 1000 hours of salt spray protection when tested per ASTM B117-03 standard. One sleeve size fits all models (select 1 of 3 adjustable depth sleeves: 5.5" to 8.5", 8.0" to 13.5", 13.0" to 23.5"). Sleeve location shall be at least 31" above finished floor and shall be adjustable by +3". Floor base shall be provided to raise height over 34" above finished floor. Wall sleeve shall be continuous from outside wall to rear of unit for weather tight installation.

2. Furnish factory 1" louver designed for condenser air and outside air intake and exhaust. Louver shall be aluminum construction with removable core for service. Access to removable core is by tamper-proof screws. Louver shall have a powder coat finish. See our color chart for color selections.

3. Painted 3-sided assembly to enclose ductwork, piping as required, or to fill space from duct-free plenum boxes to ceiling if desired.

23 81 19.03 EXECUTION

A. INSTALLATION

1. Installation shall be in strict accordance with manufacturer's instructions.

DIVISION 23

SECTION 23 81 26: SPLIT SYSTEM HEAT PUMP (DUCTLESS)

23 81 26.01: GENERAL

A. SCOPE

1. The provisions of Section 23 05 00 apply to all the work in this Section.

2. Furnish and install split system air heat pumps as required to provide a complete and satisfactory job.

B. SUBMITTALS. Submit the following in accordance with Section 23 05 00:

1. Manufacturer's cuts.

2. Certified capacity ratings.

3. Installation instructions.

4. Operating and Maintenance Instructions.

23 81 26.02: PRODUCTS

A. SPLIT SYSTEM A/C UNIT (DUCTLESS)

1. Furnish and install an air cooled heat pump/direct expansion fan coil combination. The outdoor section shall be factory assembled, having direct drive fans with horizontal air discharge, reciprocating compressor, refrigerant coil fan motor(s) prewired control panel and a holding charge of refrigerant. The indoor fan coil unit shall have horizontal discharge and will include refrigerant coil, fan and motor, condensate pan with drain, thermal expansion valve, prewired control panel and remote thermostat control.

2. Refrigerant coils shall be of nonferrous construction with mechanically bonded, smooth plate fins. All tube joints shall be brazed with phoscopper or silver alloy. Coils shall be pressure tested at the factory.

3. Unit shall be furnished with direct drive, propeller type fans arranged for horizontal discharge. Condenser fan motors shall have inherent protection and shall be of the permanently lubricated type resiliently mounted for quiet operation. Each fan shall have a safety guard.

4. Evaporator fan section shall have forward curved blade, double inlet fans mounted on a solid shaft. Fan shall be statically and dynamically balanced and shall run on permanently lubricated bearings.

5. Cabinets shall be made of galvanized steel, bonderized and finished with baked enamel.

6. Compressor shall be serviceable hermetic type. It shall be mounted so as to avoid

vibration. It shall be equipped with high and low pressure protection.

7. System Control. The system shall utilize a microprocessor controller with diagnostic capability, located in the indoor unit. Wall mounted remote control with operation indicator lamps to be used for temperature control, airflow selection rate (including automatic airflow rate change according to room temperature), motorized air vane operation, economy operation selection feature, and on/off switching.

8. Room Air Dampers. Indoor unit shall have motorized air vanes which sweep air from front to back of room by modulating the horizontal air vanes in the vertical plane. Air vanes can be set in a fixed position by a switch on the remote control. Horizontal discharge shall be manually adjusted to desired direction by setting vertical vanes located behind the horizontal motorized air vanes.

9. Return Air shall be filtered by means of easily removable, washable filters. The filters shall be accessible without tools or exposure to hazardous electrical or moving parts. Provision shall be made to have a filtered outdoor air duct connection to provide fresh air to the unit.

10. Manufacturer shall have been established in the United States for a period of 5 years and shall have parts and service organizations located not more than 100 miles from the site.

11. Provide Bacnet card for integration into the building automation system. See section 15900 for further clarification.

DIVISION 23

SECTION 23 81 43: SPLIT SYSTEM HEAT PUMPS

23 81 43.01 GENERAL

A. SCOPE

1. The provisions of Section 23 05 00 apply to all the work in this Section.

2. Furnish and install split system heat pumps required to provide a complete and satisfactory job.

B. SUBMITTALS Submit the following in accordance with Section 23 05 00:

1. Manufacturer's cuts.

2. Certified capacity ratings.

3. Installation instructions.

4. Operating and Maintenance Instructions.

23 81 43.02 PRODUCTS

A. SPLIT SYSTEM HEAT PUMPS

1. Furnish and install an air-to-air electric heat pump (outdoor unit) in combination with a direct expansion fan-coil heat pump (indoor unit) in the location and manner shown on the plans.

2. Coils shall be constructed with aluminum plate fins mechanically bonded to non-ferrous tubing with all joints brazed.

3. Outdoor unit shall contain hermetically sealed compressor with automatically reversible oil pump, internal and external motor protection. Outdoor fan shall be propeller type, arranged for vertical discharge, and direct driven by a factory lubricated motor.

4. Indoor unit shall operate properly in either vertical upflow or horizontal position with or without ductwork. Unit may be installed vertically or horizontally with electric resistance heater and shall contain refrigerant metering device and indoor fan relay. Fan shall be centrifugal type, direct driven.

5. Controls and protective devices shall include a high pressurestat, 2 low pressurestats, crankcase heater, suction line accumulator and pressure relief device. Motor compressor shall have both thermal and current sensitive overload devices. Outdoor unit wiring shall incorporate a positive acting timer to prevent compressor short cycling if power is interrupted. Device shall prevent compressor from restarting for a five minute period. An automatic defrost control shall be included to accomplish defrosting (only if required) every 90 minutes for a period of not more than 10 minutes. A 24 volt transformer shall be factory installed and wired on

outdoor units for external control circuit.

6. Provide Bacnet card for integration into the building automation system. See section 15900 for further clarification.

23 81 43.03 EXECUTION

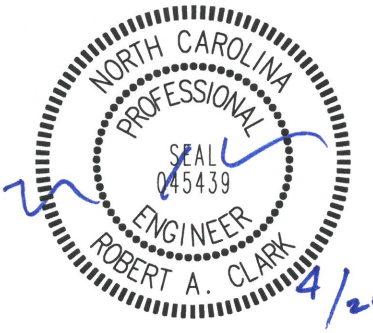
A. INSTALLATION

1. Fan coil and heat pump shall be installed in accordance with the manufacturer's recommendations.

2. Fan coil and heat pump shall be installed in fully accessible locations.

INTRODUCTION TO DIVISIONS 26, 27 & 28 – ELECTRICAL, TELEPHONE & FIRE ALARM

The Specification Sections applying to the Electrical, Telephone and Fire Alarm Work for the Stump Sound Elementary School in Onslow County, North Carolina are as follows:



4/29/19

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SECTION 26 00 00 – ELECTRICAL ALTERNATES

1. ALTERNATE #1 Six (6) Classroom Additions – (ADD OR DEDUCT) – This Alternate is to provide six (6) additional classrooms; two (2) added to each wing. Refer to Sheets E700 and E701.

2. ALTERNATES #2 – NOT APPLICABLE TO ELECTRICAL SCOPE

3. ALTERNATE #3(1) – (ADD OR DEDUCT) – FIRE ALARM EQUIPMENT BY NOTIFIER
   State on the proposal the amount of monies that shall be added to or deducted from the base bid for providing fire alarm equipment by single source manufacturer Notifier as per Specification Section 28 31 12.

4. ALTERNATE #3(2) – (ADD OR DEDUCT) – PROVIDE ELECTRICAL EQUIPMENT BY SQUARE-D
   State on the proposal the amount of monies that shall be added to or deducted from the base bid for providing electrical equipment by single source manufacturer Square-D as per Specification Sections 26 24 13 Switchboard, 26 24 16 Panelboards, 26 28 16 Disconnects, 26 09 23 Contactors and 26 51 00 Contactors.

5. ALTERNATE #4 – (ADD OR DEDUCT) – Generator (Emergency Shelter Situation) - State on the proposal the amount of monies that shall be added to or deducted from the base bid for providing a generator for kitchen, dining and multi-purpose rooms to provide power to school, in the event that the school becomes an emergency shelter as shown on Drawings E601, E304 and Specifications 26 32 01.01 and 26 36 01.02

END OF SECTION 26 00 00

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SECTION 26 01 00 – ELECTRICAL GENERAL PROVISIONS

A. GENERAL

1. Scope of Work

   a. This Contractor shall provide all materials, equipment and labor necessary to install and set into operation the electrical equipment as shown on the Engineering Drawings and as contained herein.

2. Quality Assurance

   a. See the General and Supplementary General Conditions and Architectural Divisions.

   b. All work shall be in accordance with the North Carolina State Building Code, which includes the latest edition of the National Electrical Code.

   c. The Contractor shall be responsible for obtaining all permits and shall notify inspection departments as work progresses.

   d. Wherever the words "Approved", "Approval", and "Approved Equal" appear, it is intended that items other than the model numbers specified shall be subject to the approval of the Engineer.

   e. "Provide" as used herein shall mean that the Contractor responsible shall furnish and install said item or equipment. “Furnish" as used herein shall mean that the Contractor responsible shall acquire and make available said item or equipment and that installation shall be by others. "Install" as used herein shall mean that the Contractor responsible shall make installation of items or equipment furnished by others.

   f. All material and equipment that the Contractor proposes to substitute in lieu of those specified shall be submitted to the Engineer ten (10) days prior to the bid date for evaluation. The submittal shall include a full description of the material or equipment and all pertinent engineering data required to substantiate the equality of the proposed item to that specified. Items that are submitted for approval after this date will not be accepted.

   g. All personnel under this Contractor’s supervision shall be qualified to perform those portions of the work assigned to them. Personnel (including project managers) deemed to be negative to the overall success of the project shall be removed from the project and replaced with qualified personnel who will be positive for the project. Upon written notification that particular personnel have been deemed negative to the overall success of the project, this Contractor shall immediately replace such particular personnel. The engineer shall be sole arbiter and any decision regarding fitness of this Contractor’s personnel for this project shall not be subject to appeal.

3. Substitutions

   a. Products are specified for use on this project by the following:

      1) Reference Standards and Description: All products shall meet the Reference Standards and Description (i.e., conduit and conduit fittings).

      2) Naming of a product as an example to denote the quality standard of the product desired, in which case three or more brands will be denoted (where applicable) to establish equivalent designs. Naming of a product does not restrict Bidders to a specific brand (i.e., fixtures, devices, etc.).

   Requests for approval of manufacturer's or substitutions which have not been pre-approved shall be made by using the forms at the end of this section.

b. During bidding period: Submitted written requests from Bidders Only, using the forms herein, will be considered if received ten (10) calendar days prior to the date of receipt of bids to allow for proper evaluation. Requests from suppliers or subcontractors will not be considered. Substitutions will be considered when a product becomes unavailable through no fault of the Contractor.

A request constitutes a representation that the Bidder/Contractor:

1) Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product and is suitable for use in the Work.
2) Will provide the same warranty for the substitution as for the specified product.
3) Will coordinate installation and make changes to other work which may be required for the work to be complete with no additional cost to the Owner.
4) Waives claims for additional cost or time extension which may subsequently become apparent.
5) Has included a list of similar projects on which this product has been used with names and telephone numbers for verification.
6) Has written verification from the product manufacturer that this product has been in use a minimum of two (2) years on a project similar to this work.

Substitutions will not be considered when they are indicated or implied on shop drawings or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

c. Architect/Engineer Review

1) Review and approval will rely on manufacturer's literature and other data as outlined herein.
2) Inadequacies in such submittals that fail to identify unsuitability are the responsibility of the parties making submittal.

d. Substitution Procedure

1) Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
2) Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence.
3) Submit listing of similar projects.
4) Submit manufacturer's written verification that product has been in use a minimum of two (2) years at similar projects.
5) The Architect/Engineer will notify Contractor, in writing, of decision to accept or reject request.
6) Products bid or incorporated in the work that are not specified and without written approval of the Architect/Engineer may not be acceptable, and if not, the Contractor will be required to furnish and install the products specified.
7) The Architect/Engineer will issue written approvals of product substitutions to all Bidders. Substitutions are not approved without written approval.

4. Submittals

a. See General and Supplementary General Conditions and Division 1.

b. Within ten (10) days after notification of the award of the Contract and written notice to begin work, the Contractor shall submit for approval to the Architect/Engineer a detailed list of equipment and material which he proposes to use.

c. The Contractor shall provide six (6) sets of submittal data bound in a 3-ring binder. The 3-ring binder shall contain complete submittal data on **all** products, methods, etc. proposed for use on the project. Permission shall be obtained from the Engineer to submit data outside of the 3-ring binder, such as submittal data requiring early review for special ordering purposes.

d. Each submittal shall bear the approval of the Contractor indicating that he has reviewed the data and found it to meet the requirements of the specifications as well as space limitations and other project conditions. The submittals shall be clearly identified showing project name, manufacturer's catalog number and all necessary performance and fabrication data. Detailed submittal data shall be provided when items are to be considered as substitution for specified items. Acceptance for approval shall be in writing from the Engineer.

e. The Contractor shall submit to the Engineer a set of accurately marked-up plans indicating all changes encountered during the construction. Final payment will be contingent on receipt of these as-built plans.

f. The Contractor shall furnish four (4) bound sets of maintenance and operating instructions as outlined in Paragraph C, Execution, Item #7, of this specification section.

g. The Contractor shall submit to the Engineer a duplicate set of final electrical inspection certificates prior to final payment.

5. Product Delivery, Storage and Handling

a. All material and equipment shall be delivered and unloaded by the Contractor within the project site as noted herein or as directed by the Owner.

b. The Contractor shall protect all material and equipment from breakage, theft or weather damage. No material or equipment shall be stored on the ground.

c. The material and equipment shall remain the property of the Contractor until the project has been completed and turned over to the Owner.

6. Work Conditions and Coordination

a. The Contractor shall review the entire set of plans to establish points of connection and the extent of electrical work to be provided in his Contract.

b. This Contractor shall be responsible for all electrical work and make final connections to equipment installed in his Contract.

c. Pipe, conduit and duct chases required for installation of work shall be provided by the General Contractor unless otherwise noted. This Contractor shall be responsible for coordinating the location of all required chases.

d. All work shall be coordinated with other trades. Cutting of new work and subsequent patching shall be approved by Architect/ Engineer and shall be at the Contractor's expense with no extra cost to the Owner.

7. Guarantee

a. See the General and Supplementary General Conditions.

b. Where extended warranties or guarantees are available from the manufacturer, the Contractor shall prepare the necessary Contract Documents to validate these warranties as required by the manufacturer and present them to the Architect/Engineer.

B. PRODUCT

1. Material and equipment shall be new, unless noted otherwise, of the highest grade and quality and free from defects or other imperfections. Material and equipment found defective shall be removed and replaced at the Contractor's expense.

2. The Contractor shall furnish and install engraved laminated phenolic nameplates for all safety switches, panelboards, transformers, switchboards, motor control centers and other electrical equipment supplied for the project for identification of equipment, controlled, served, phase, voltage, etc. Nameplates shall be securely attached to equipment with self-tapping cadmium plated screws, and shall identify equipment controlled, attached, etc. Letter shall be approximately 1/2 inch high minimum. Embossed, self-adhesive plastic tape is not acceptable for marking equipment. Nameplate material colors shall be:

-Blue surface with white core for 120/208 volt equipment.
-Black surface with white core for 277/480 volt equipment.
-Bright red surface with white core for all equipment related to Fire Alarm system.
-Dark red (burgundy) surface with white core for all equipment related to Security.
-Green surface with white core for all equipment related to "Emergency" systems.
-Orange surface with white core for all equipment related to Telephone systems.
-Brown surface with white core for all equipment related to Data systems.
-White surface with black core for all equipment related to Paging systems.
-Purple surface with white core for all equipment related to TV systems.

3. All empty conduit runs and conduit with conductors for future use shall be identified for use and shall indicate where they terminate. Identification shall be by tags with string or wire attached to conduit or outlet.

4. All outlet boxes, junction boxes and pull boxes shall have their covers and exterior visible surfaces painted with colors to match the surface scheme outlined above. This includes covers on boxes above lift-out and other type accessible ceilings.

5. All materials and equipment shall comply with the Underwriters' Laboratories, Inc. standards or have UL approval, or bear UL re-examination listing where such approval has been established for the type of device in question.

C. EXECUTION

1. Inspection

a. If any part of this Contractor's work is dependent for its proper execution or for its subsequent efficiency or appearance on the character or conditions of contiguous work not executed by him, the Contractor shall examine and measure such contiguous work and report to the Architect or Engineer in writing any imperfection therein, or conditions that render it unsuitable for the reception of this work. Should the Contractor proceed without making such written report, he shall be held to have accepted such work and the existing conditions and he shall be responsible for any defects in this work consequent hereon and will not be relieved of the obligation of any guarantee because of any such imperfection or condition.

2. Installation

a. All work shall be performed in a manner indicating proficiency in the trade.

b. All conduit, pipes, ducts, etc., shall be either parallel to building walls or plumb where installed in a vertical position and shall be concealed when located in architecturally finished areas.

c. Any cutting or patching required for installation of this Contractor's work shall be kept to a minimum. Written approval shall be required by the Architect/Engineer if cutting of primary structure is involved.

d. All patching shall be done in such a manner as to restore the areas or surfaces to match existing finishes.

e. The Contractor shall lay-out and install his work in advance of pouring concrete floors or walls. He shall furnish and install all sleeves or openings through poured masonry floors or walls above grade required for passage of all conduits, pipes or duct installed by him. The Contractor shall furnish and install all inserts and hangers required to support his equipment.

f. Grounding

1) All grounding shall be in accordance with the requirements of the NEC. The main secondary service ground from transformer service entrance and from generator service entrances shall be bare copper wire in conduit to water main at point where water main enters the building and connected using heavy duty brass clamp type connector. Bond ground wire to conduit at each end. Bond system neutral bus to equipment grounding bus sized per table 250-66 of the NEC.

2) Extend ground conductors in conduit from grounding bus of each motor control center to main switchboard, bond to equipment grounding bus of main switchboard at this point.

3) The secondary neutral of each dry type transformer shall be bonded to the conduit system and to transformer case and a ground wire extended to the nearest grounding electrode, per the NEC.

4) Install a #12 TW green grounding jumper from the ground terminal of each receptacle to a sheet metal screw on the outlet box.

5) Install ground wire in all flexible connections (flex shall not be acceptable for grounding purposes), and in all wiremold.

3. Performance

a. The Contractor shall perform all excavation and backfill operations necessary for installation of his work.

b. Rock excavation shall be defined in the Supplementary General Conditions, Division 1 or Division 2. Unless specifically stated, neither rock excavation nor a unit price for rock excavation shall be required in the bid.

4. Erection

a. All support steel, angles, channels, pipes or structural steel stands and anchoring devices that may be required to rigidly support or anchor material and equipment shall be provided by this Contractor.

5. Field Quality Control

a. The Contractor shall conform to the requirements of Division 3 for concrete testing.

b. The Contractor shall test his entire installation and shall furnish the labor and materials required for these tests. Tests shall be performed in accordance with the requirements of the particular section of the specifications and in accordance with the requirements of the State Ordinances and Codes, and the National Electrical Code. The Contractor shall notify the

Architect or Engineer of his readiness for such test. A final inspection by the Electrical Inspector or Local Authority Having Jurisdiction is required, and an inspection certificate is required prior to authorization of final payment.

c. Testing required for compliance with the Contract shall be stated in subsequent sections.

6. Adjust and Clean

a. All equipment and installed materials shall be thoroughly clean and free of all dirt, oil, grit, grease, etc.

b. Factory painted equipment shall not be repainted unless damaged areas exist. These areas shall be touched up with a material suitable for the intended service. In no event shall nameplates be painted.

c. At a scheduled meeting, the Contractor shall instruct the Owner or the Owner's representative in the operation and maintenance of all equipment installed under his Contract (in the presence of the Engineer).

d. The Contractor shall provide to the Owner, at no additional cost, a video recording (VHS format) of all training sessions held to train the Owner in the operation and maintenance of all fire alarm systems, sound systems, security systems, lighting control systems, integrated communication systems, CCTV, MATV, CATV, and all other electrical systems requiring training.

7. Maintenance and Operating Manual

a. The Contractor shall prepare four (4) copies of a manual describing the proper maintenance and system operation. This manual shall not consist of standard factory printed data intended for dimension or design purposes (although these may be included), but shall be prepared to describe this particular job. This manual shall include the following:

1) Data on all equipment as listed on the fixture and equipment schedules on the plans. Also data on all fire alarm, telephone system, public address system, security system, lighting control systems, CCTV, MATV, CATV, generator, battery backup system, etc. that are applicable for the project.

2) A check list for periodic maintenance of all equipment requiring maintenance. (i.e., fire alarm system, security system, generator, battery backup system, etc.)

3) Maintenance and spare parts data for all equipment.

4) As-Built wiring for equipment containing field wired systems. (i.e., fire alarm, security, data system, CATV, telephone, public address, etc.)

5) The manuals shall be bound, indexed, dated and signed by the Contractor when completed.

b. The operating and maintenance manuals shall be submitted to the Engineer for approval. When the manuals are considered complete by the Engineer, they will be turned over to the Owner for their permanent use.

SUBSTITUTION AND PRODUCT OPTIONS

TO: PROGRESSIVE DESIGN COLLABORATIVE, LTD.
Post Office Box 61249
Raleigh, North Carolina 27661-61249

PROJECT NAME: _____

The undersigned requests that the following product be considered for substitution in lieu of the specified item in Project Manual Section_____ Page_____ Paragraph_____ Description of Item:

_____

_____

_____

Proposed Substitution: _____

_____

The undersigned certifies that the following statements are correct, unless modified on an attachment:

1. The proposed substitution is equal or better in appearance, function and quality to the specified item, in all respects and is suitable for inclusion in the Work.
2. Attached are 4 copies of the Manufacturers Product Description, Specifications, Data Sheets, Photographs, Test Data and Color Charts.
3. We will furnish a physical sample, if requested by the Architect/Engineer.
4. Every variation of this product is to be listed and clearly delineated on the submission.
5. This substitution will require no dimensional changes to the drawings and will have no effect on other trades, the construction schedule or warranty requirements.
6. List of similar type project in which product is used.
7. Verification from manufacturer that product has been in use a minimum of two (2) years at similar projects.

SUBSTITUTIONS AND PRODUCT OPTIONS:

MANUFACTURER OR REPRESENTATIVE
Submitted by:

Name:_____

Firm:_____

Address:_____

_____

_____

Phone No.:_____

Date:_____

Signature:_____

CONTRACTOR OR BIDDER
Submitted by:

Name:_____

Firm:_____

Address:_____

_____

_____

Phone No.:_____

Date:_____

Signature:_____

By approving and submitting shop drawings, product data and samples, the Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related hereto, or will do so, and that he has checked and coordinated the information contained within such submittals with the requirements of the work and of the Contract Documents.

The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Architect/Engineer's approval of shop drawings, product data or samples unless the Contractor has specifically informed the Architect/Engineer in writing of such deviation at the time of submission and the Architect/Engineer has given written approval to the specific deviation. The Contractor shall not be relieved from responsibility for errors or omissions in the shop drawings, product data or samples by the Architect's approval.

Architect's Reply:

( ) APPROVED
( ) APPROVED AS CORRECTED
( ) REVISE AND RESUBMIT
( ) NOT APPROVED

ARCHITECT:

_____

By:_____

Signature:_____

Date:_____

Engineer's Reply:

( ) APPROVED
( ) APPROVED AS CORRECTED
( ) REVISE AND RESUBMIT
( ) NOT APPROVED

ENGINEER:

PROGRESSIVE DESIGN COLLABORATIVE

By:_____

Signature:_____

Date:_____

END OF SECTION 26 01 00

SECTION 26 05 19 – WIRES AND CABLES

A. GENERAL

1. All conductors shall be properly marked showing manufacturer's name, insulation type, voltage rating and wire size. All insulation is to be rated for minimum of 600 volts.

2. Wire sizes shall be as shown. No wire smaller than No. 12 AWG shall be used. The maximum wire size shall be 500 kcmil.

3. No. 10 AWG conductors shall be used for 20 ampere branch circuit home runs exceeding 50 feet to the junction point. 20 ampere branch circuit wiring shall be No. 10 AWG throughout if the circuit is longer than 100 feet in total length.

4. Conductors shall be manufactured by Triangle, Okonite, Houston Wire and Cable, or approved equivalents. All wiring and cable shall be listed by an "approved' third party testing agency.

5. Fire alarm and control wiring shall have stranded conductors. Refer to fire alarm specification 28 31 10 and fire alarm guidelines on the State Construction Office website.

B. PRODUCT

1. All conductors shall be copper and shall comply with NEMA WC70. Wires No. 10 and smaller shall be solid. Wires 8 and larger shall be Class B stranded.

2. All wire shall be labeled two (2) feet on centers giving size, type voltage, rating, and manufacturer's name. Wire No. 6 and smaller shall be factory color coded. Wire larger than No. 6 may be color coded with Okonite 2000 volt colored tape at all terminals of the run, and at all junctions.

3. Where applicable, all wire shall be color coded as follows, or approved by the Engineer:

   a. 277/480 volt system:

      1) Phase A - Brown
      2) Phase B - Orange
      3) Phase C - Yellow
      4) Neutral - Natural Gray
      5) Ground - Green

   b. 120/208 volt system:

      1) Phase A - Black
      2) Phase B - Red
      3) Phase C - Blue
      4) Neutral - White
      5) Ground - Green

4. Insulation type shall be labeled for the appropriate type of use and temperature. Insulation types are as follows:

   a. Type THWN/THHN or XHHW for feeders and branch circuit conductors.

   b. Branch circuit wire in fluorescent fixture channels shall be type THHN, or type XHHW with cross-linked polyethylene insulation.

C. EXECUTION

1. Conductors, in all cases, shall be run in conduit and shall be continuous from outlet to outlet. Splices will not be permitted except within accessible outlet or junction boxes, troughs, or gutters.

2. Solid conductors shall be spliced by using Ideal "wing-nuts", 3M Company's "Scotchlok", or T and B connectors in junction boxes, outlet boxes and lighting fixtures. Sta-Kon or Crimp connectors will not be allowed for branch circuit splicing.

3. Joints in stranded conductors shall be spliced by approved mechanical connectors and gum rubber tape or friction tape. Solderless mechanical connectors for splices and taps, provided with UL approved insulating covers, may be used instead of mechanical connectors plus tape.

4. All conductors in any conduit shall be at one specific voltage. Conductors of different voltages shall be run in separate conduits.

5. Neutral conductors shall be properly installed as to prevent grounding of the neutrals in any conduit.

   a. Full size neutral conductors shall be provided for each service panel and sub-panel.

   b. Minimum of full size individual neutral wire shall be provided for each circuit; in other words, no sharing of the neutral between circuits is allowed.

6. Neatly train and lace wiring inside boxes, equipment, and panelboards.

7. Make conductor lengths for parallel circuits equal.

8. Pull all conductors into a raceway at the same time. Use listed wire pulling lubricant for pulling #4 AWG and larger wires.

9. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.

10. Prior to energizing feeders, sub-feeders and service conductor cables shall be tested for electrical continuity and short circuits. A copy of these tests shall be sent to the State Construction Office, the engineer of record, and the owner.

11. 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. The procedures listed below shall be followed:

    a. Minimum readings shall be one million (1,000,000) or more ohms for #6 AWG wire and smaller, 250,000 ohms or more for #4 AWG wire or larger, between conducts and between conductor and the grounding conductor.

    b. 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 the grounded enclosure. If this reading is less than 250,000 ohms, the Contractor shall disconnect the branch circuit neutral wires from this neutral bar. He shall then test each one separately to the panel and until the low readings are found. The Contractor shall correct troubles, reconnect and retest until at 250,000 ohms from the neutral bar to the grounded panel can be achieved with only the neutral feeder disconnected.

    c. The Contractor shall send a letter to the Engineer certifying that the above has been done and tabulating the megger readings for each panel. This shall be done at least four (4) days prior to final inspection.

d. At final inspection, The Contractor shall furnish a megger and show the Engineer's representatives that the panels comply with the above requirements. He shall also furnish a hook-on type ammeter and voltmeter to take current and voltage readings as directed by the representatives.

12. Use of split bolts is not allowed.

13. A green grounding conductor, sized in accordance with the latest issue of the NEC, shall be installed in all conduits with circuit conductors.

14. Upon completion of installation of the electrical grounding and bonding systems, the ground resistance shall be tested with a ground resistance tester. Where tests show resistance-to-ground is over 25 ohms, appropriate action should be taken to reduce the resistance to 25 ohms, or less, by driving additional ground rods. (The compliance should be demonstrated by retesting.)

15. All exposed wiring shall be contained in a minimum of 3/4" conduit or surface mounted raceway. This shall include, but not be limited to, fire alarm, security, power distribution, intercom, telephone and communication wiring. Wiring located above a ceiling or inside walls shall not be considered exposed.

16. Conductors for branch circuits shall be sized to prevent a voltage drop exceeding three percent (3%) at the farthest outlet of power, heating and lighting loads, or any combination of such loads. The maximum total voltage drop on both feeders and branch circuits to the farthest outlet shall not exceed five percent (5%).

    a. Where the branch circuit conductor length from the panel to the first outlet on a 277 volt circuit exceeds 125 feet, the branch circuit conductors from the panel to the first outlet shall not be smaller than #10 AWG. Increase the branch circuit conductor size an additional wire size for reach 125' of additional length of the entire circuit. The ground conductor size shall be increased proportionately to the increase in the phase conductors per 2017 NEC 250.122(B).

    b. Where the conductor length from the panel to the first outlet on a 120 volt circuit exceeds 50 feet, the branch circuit conductors from the panel to the first outlet shall not be smaller than #10 AWG. Increase the branch circuit conductor size an additional wire size for reach 100' of additional length of the entire circuit. The ground conductor size shall be increased proportionately to the increase in the phase conductors per 2017 NEC 250.122(B).

17. All tests specified shall be completely documented indicating time of day, date, temperature and all pertinent test information. All required documentation of readings shall be submitted to the Engineer prior to, and as one of the prerequisites for, final acceptance of the project.

END OF SECTION 26 05 19

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SECTION 26 05 33 – CONDUIT AND CONDUIT FITTINGS

A. GENERAL

1. Conduit shall be delivered to the project site in bundles of full length pipes, each length marked with the trademark of the manufacturer and the Underwriters' Laboratories, Inc. stamp. Each conduit length shall be straight, true and free from scales, blisters, burrs and other imperfections.

2. Within the building perimeters and above the floor slab, the rigid steel conduit specified shall be used unless specifically noted otherwise.

3. Conduit size for control wiring shall be a minimum of three-quarter (3/4”) inch conduit. All branch circuit conduit shall be a minimum of 3/4". Percent filled and derating shall be in accordance with the National Electrical Code.

4. All conduit located exterior to the building shall be one (1) inch minimum size.

5. All conduit shall be installed in accordance with the National Electric Code.

6. Conduit shall be manufactured by Triangle, G.E., or Carlon, or approved equivalents.

7. Conduit fittings shall be manufactured by Rayco, T & B, or Gedney, or approved equivalents.

8. Surface mounted metal raceway shall be used as noted on the plans in lieu of exposed conduit. Surface mounted raceway shall be manufactured by Wiremold or approved equivalents. A separate ground wire shall be run in the surface mounted raceway.

9. All underground conduit shall be identified by underground line marking tape located directly above the raceway at 6 to 8 inches below finished grade. Tape shall be six (6) inch wide, 7.0 mil (minimum) overall thickness, non-distorting, colorfast, no-stretch, 600 pound tensile strength per 6" width, ultraviolet light fast. Message must repeat within a maximum of 40 inches. Tape shall be THOR Enterprises "Duratec" or equivalent. Painted legend shall be indicative of type of underground line.

10. Non-metallic wall conduit described in this specification shall be a minimum of Schedule 40 unless specifically noted otherwise.

11. In all areas where fire rated walls, floors, and ceilings are installed, all penetrations of electrical conduits or other related electrical material shall be properly sealed with approved fire rated materials to maintain the rating of the building construction. See fire-stop system details.

B. PRODUCT

1. Conduit shall be manufactured by: Triangle, G.F., Allied, Wheatland, or approved equal.

2. Conduit fittings shall be manufactured by: Rayco, T&B, Appleton, or approved equal.

3. Thin Wall Conduit and Fittings

   a. Electrical metallic tubing (EMT) shall be cold-rolled steel tubing with zinc coating on the outside and protected on the inside by a zinc, enamel or equivalent corrosion-resistant coating conforming to the latest requirements of ANSI. Conduit shall meet the Rigid Conduit Association Standards.

   b. Electrical metallic tubing fittings shall be all steel plated hexagonal threaded compression type. No pot metal set screws or indenter fittings shall be used. EMT connectors shall have insulated throats.

4. Rigid Steel Conduit and Fittings

    a. Rigid steel conduit, including elbows and nipples, shall be standard weight, mild steel pipe, hot dipped galvanized, sherardised or zinc-coated conforming to the requirements of ANSI C80.1, 1966 or later edition. Rigid steel conduit shall also meet the latest requirements of Underwriters' Laboratories, Inc. Standards for Rigid Metallic Conduit.

    b. Fittings shall be of approved types, made of malleable iron hot dipped galvanized.

5. Flexible Metal Conduit and Fittings

    a. Flexible metal conduit shall be of the best grade interlocking spiral strip steel. The interlocking spiral strip construction shall be such as to permit bending of the conduit to a radius of four (4) times its internal diameter without distorting at any point. The interior and the exterior of the flexible conduit shall be smooth and free of burrs, sharp edges, or other defects which could damage the wire.

    b. All connectors shall be steel compression fittings with insulated throats.

    c. Where water tight flexible conduit is required, it shall have an outer sheath of material similar to PVC.

6. Non-metallic Conduit

    a. Non-metallic conduit shall be listed, for its particular application. It shall be resistant to sunlight and chemical and moisture atmospheres, and rated for use with 90 degrees Celsius conductors.

    b. The installation and usage of rigid non-metallic conduit shall comply with Article 347 of the National Electrical Code, along with any related or referenced sections.

C. EXECUTION

1. General

    a. All conduit shall be run tight against walls, columns or ceilings.

    b. The conduit shall bend cold 90 degrees about a radius equal to ten (10) times its own diameter without signs of flaw or fracture in either pipe or protective coverings. All bends and offsets shall be made on a forming tool to prevent the conduit or its coating from being damaged in the bending.

    c. Where conduits join any couplings or threaded fittings, the ends shall be made watertight.

    d. All conduits shall be carefully cleaned before and after erection. After cleaning, all ends of conduits shall be free from burrs and inside surfaces shall be free from imperfections likely to injure the wires or cables.

    e. In every instance, conduit shall be installed in such a manner that the conductors may readily and easily be drawn or pulled in without strain or damage to the insulation; and, also, so that defective conductors may be readily and easily withdrawn and replaced by new conductors. Long radius bends and a sufficient number of approved pull and junction boxes shall be approved for this purpose, and as may be directed by the Engineer. All conduit shall be securely supported and grounded.

f. In unfinished areas, exposed conduit shall be run to conform to the building lines with special emphasis on neatness. Location of outlet boxes to support suspended lighting fixtures shall be determined by means of templates prepared to match fixtures. Turns shall be made with galvanized outlet boxes, junction boxes, factory fittings and/or symmetrical bends. Locknuts and bushings shall be employed to provide full grounding and adequate protection of insulation.

g. Support for all conduit shall be in accordance with the National Electrical Code. Conduit shall be supported by approved pipe straps or clamps, secured by means of toggle bolts on hollow masonry; expansion shields and matching screws or standard pre-set inserts on concrete or solid masonry, machine screws or sheet metal screws on metal surfaces, and wood screws on wood construction.

h. All empty conduit systems shall be capped or terminated in a junction box and shall be provided with nylon pull cord inside for future use.

i. Conduit terminating below grade shall be provided with means to prevent entry of dirt or moisture. Depth of burial shall not be less than two (2) feet below grade. All termination points shall be accurately marked and dimensioned on the As-Built Plans.

j. MC cable and flexible metal conduit can only be used as “fixture whip” and related type equipment connection in lengths up to 6’-0” only. EMT conduit and rigid conduit shall be used inside the building as outlined in this specification section.

2. Thin Wall Conduit and Fittings

a. Except for service and feeder conduits, electrical metallic tubing and fittings may be installed in lieu of rigid conduit for 2” (two inch) or smaller in dry construction in furred spaces, ceiling cavities, chase spaces, interior portions other than concrete and solid plaster, or for exposed work except on mechanical structure or supports.

b. Electrical metallic tubing shall not be installed where subject to severe physical damage, nearer than four (4) feet from finished floor in exposed areas, subject to severe corrosive conditions, in trade sizes larger than two (2) inches, located in exterior walls, or in poured concrete.

c. A transition between a run of rigid conduit concealed in a wall and a run of thin wall conduit along a ceiling shall be made in an outlet box above the ceiling, if accessible, near the wall.

3. Rigid Steel Conduit and Fittings

a. All conduit terminations shall be provided with insulating bushings.

b. Condulet fittings shall not be used in lieu of pull boxes.

c. Except where located under the ground floor slab, all service and feeder conduit shall be heavy wall (rigid galvanized).

d. Rigid steel conduit shall be installed in exterior masonry walls, in wet locations where subject to severe physical damage, or where conduit trade size is two and one half (2 1/2) inches or larger.

4. Flexible Metal Conduit and Fittings

a. Flexible metallic conduit shall be provided at the end of each conduit run terminating at the conduit box on electric motors, transformers or other equipment.

b. In ceiling cavities, flexible metallic conduit may be installed from an outlet box to the lighting fixture as a "fixture whip". Conduit smaller than 3/4" shall be limited to lengths of 6 feet or less.

c. The length of flexible conduit shall be in accordance with the National Electric Code.

5. Non-Metallic Conduit

a. Except as listed below, non-metallic conduit shall be used only where specifically noted on the plans.

b. Thin wall rigid non-metallic conduit shall be used for concrete encasement.

c. When noted on the plans, heavy wall rigid non-metallic conduit shall be used when located above ground, or below ground for direct burial.

d. Except where embedded in concrete, conduit shall be supported to permit adequate lineal movement to allow for expansion and contraction of conduit due to temperature change. Where a temperature change in excess of 14 degrees Celsius is anticipated, such as direct burial, exposed outside of the building, or in uninsulated spaces inside the building (attics, crawl spaces, etc.), expansion joints shall be installed in accordance with the manufacturer's specifications.

e. Heavy wall non-metallic conduit shall be used where conduits are direct buried exterior to the building.

f. Where conduit is installed under the ground floor slab within the building foundations, thin wall rigid non-metallic conduit shall be used. At the Contractor's option, this installation may consist of rigid steel conduit with a minimum of 15 mils of PVC coating. Where thin wall non-metallic conduit under the ground floor slab penetrates the slab surface or passes above the slab surface level within a wall, the conduit shall be converted at the slab surface to the metallic type conduit specified for use in that area.

END OF SECTION 26 05 33

SECTION 26 05 34 – BOXES AND CABINETS

A. GENERAL

1. The Electrical Contractor shall provide junction boxes, pull boxes, cable, support boxes, and wiring troughs as required by NEC and as otherwise indicated in the Drawings.
2. All necessary mounting hardware and accessories shall be provided for a complete installation.
3. All boxes shall be labeled for its particular application.

B. PRODUCT

1. Boxes shall be as manufactured by Steel City Electric Company, Metropolitan, B & C or approved equal.
2. Outlet boxes shall be 4" square, 2 1/8" deep except as noted below.
3. Outlet boxes shall be equipped with plaster rings of appropriate depth to finish flush with finished walls. Outlets in exposed masonry wall shall be equipped with extra deep square corner tile rings so that box may be installed in the core of the block.
4. Outlets for concealed work and ceiling outlets for exposed work shall be galvanized stamped steel.
5. Wall outlets for exposed conduit work shall be Crouse-Hinds, Appleton, Rayco, or equivalent, series FS and FD switch and receptacle threaded hub boxes, with matching FS and FD covers.
6. Junction boxes larger than 4" square shall be galvanized and without pre-formed knockouts. Junction boxes over 12" square shall have piano hinge covers.

C. EXECUTION

1. Boxes and troughs shall be supported independently of conduit entering them. Brackets, threaded rod hangers with lock nuts, bolts, or other suitable supporting methods may be used.
2. Accessible junction boxes for change of direction or feeder taps shall be furnished where required and shall be of adequate size to prevent crowding of conductors in accordance with the requirements of the NEC.
3. Thru-the-wall outlet boxes shall not be permitted. Boxes shall be separated a minimum of 18 inches apart.
4. In general, outlets shall be installed at the heights indicated. The Contractor shall examine the plans of and coordinate with all other trades to assure mounting heights are correct for the intended purpose. Assure that all mounting heights comply with the latest version of ADA. Outlets installed at incorrect heights shall be relocated to the correct elevation at the Contractor's expense.
5. Each outlet designated on the plans shall be provided with an outlet box.
6. Each outlet box which supports a fixture shall be provided with a fixture stud into the outlet box. Outlet box and/or fixture stud shall be attached with not less than three screws or bolts.
7. Exterior outlets shall be provided with watertight gaskets and covers.
8. All boxes, including covers, for concealed junction boxes shall be painted to correspond to the appropriate color coding of the conduit system connected to the box. See Electrical General Provisions Section 26 01 00 for color coding.

END OF SECTION 26 05 34

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SECTION 26 05 73.10 – ELECTRICAL POWER SYSTEM STUDIES

A. GENERAL

1. SUMMARY

   a. The electrical equipment manufacturer shall provide electrical power system studies for the project job. The type and content of each study is specified in the following articles.

2. SUBMITTALS

   a. Completed electrical power system studies shall be bound and submitted to the engineer (architect) as part of the electrical gear/panelboard submittal.

B. PRODUCT

1. MANUFACTURERS

   a. The specified electrical power system studies shall be performed by Square D Company, GE, or Eaton.

2. ELECTRICAL POWER SYSTEM STUDIES

   a. Short-Circuit Analysis

      1) Calculation of the maximum rms symmetrical three-phase short-circuit current at each significant location in the electrical system shall be made using a digital computer.

      2) Appropriate motor short-circuit contribution shall be included at the appropriate locations in the system so that the computer calculated values represent the highest short-circuit current the equipment will be subjected to under fault conditions.

      3) A tabular computer printout shall be included which lists the calculated short-circuit currents, X/R ratios, equipment short-circuit interrupting or withstand current ratings, and notes regarding the adequacy or inadequacy of the equipment.

      4) The study shall include a computer printout of input circuit data including conductor lengths, number of conductors per phase, conductor impedance values, insulation types, transformer impedances and X/R ratios, motor contributions, and other circuit information as related to the short-circuit calculations.

      5) Include a computer printout identifying the maximum available short-circuit current in rms symmetrical amperes and the X/R ratio of the fault current for each bus/branch calculation.

      6) The system one-line diagram shall be computer generated and will clearly identify individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location and other information pertinent to the computer analysis.

      7) A comprehensive discussion section evaluating the adequacy or inadequacy of the equipment must be provided and include recommendations as appropriate for improvements to the system.

      8) The contractor shall be responsible for supplying pertinent electrical system conductor, circuit breaker, generator, and other component and system information in a timely manner to allow the short-circuit analysis to be completed prior to final installation.

9) Conductor sizes and lengths shall be logged as they are installed for the use in the study.

10) Any inadequacies shall be called to the attention of the engineer (architect) and recommendations made for improvements as soon as they are identified. The equipment manufacturer shall make the necessary changes to the equipment to correct the deficiency/problem at no additional cost to the Owner/project.

b. Protective Device Time-Current Coordination Analysis

1) The time-current coordination analysis shall be performed with the aid of computer software intended for this purpose, and will include the determination of settings, ratings, or types for the overcurrent protective devices supplied.

2) Where necessary, an appropriate compromise shall be made between system protection and service continuity with system protection and service continuity considered to be of equal importance. In general arc flash reduction shall take precedence over breaker coordination.

3) A sufficient number of computer generated log-log plots shall be provided to indicate the degree of system protection and coordination by displaying the time-current characteristics of series connected overcurrent devices and other pertinent system parameters.

4) Computer printouts shall accompany the log-log plots and will contain descriptions for each of the devices shown, settings of the adjustable devices, the short-circuit current availability at the device location when known, and device identification numbers to aid in locating the devices on the log-log plots and the system one-line diagram.

5) The study shall include a separate, tabular computer printout containing the suggested device settings of all adjustable overcurrent protective devices, the equipment where the device is located, and the device number corresponding to the device on the system one-line diagram.

6) A computer generated system one-line diagram shall be provided which clearly identifies individual equipment buses, bus numbers, device identification numbers and the maximum available short-circuit current at each bus when known.

7) A discussion section which evaluates the degree of system protection and service continuity with overcurrent devices, along with recommendations as required for addressing system protection or device coordination deficiencies.

8) Significant deficiencies in protection and/or coordination shall be called to the attention of the engineer (architect) and recommendations made for improvements as soon as they are identified. The equipment manufacturer shall make the necessary changes to the equipment to correct the deficiency/problem at no additional cost to the Owner/project.

9) The contractor shall be responsible for supplying pertinent electrical system conductor, circuit breaker, generator, and other component and system information in a timely manner to allow the time-current analysis to be completed prior to final installation.

10) The settings based on the coordination study / analysis shall be set by the manufacturer’s technical support staff prior to final turnover of the project.

11) Life Safety Systems shall be selectively coordinated as required by the latest NEC requirements.

c. Arc-Flash Hazard Analysis

1) Arc Flash hazard analysis shall be performed using the actual calculated fault current not the infinite bus fault current.

2) The Arc-Flash Hazard Analysis shall be performed with the aid of computer software intended for this purpose in order to calculate Arc-Flash Incident Energy (AFIE) levels and flash protection boundary distances.

3) The Arc-Flash Hazard Analysis shall be performed in conjunction with a short-circuit analysis and a time-current coordination analysis.

4) Results of the Analysis shall be submitted in tabular form, and shall include device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, personal-protective equipment classes and AFIE levels.

5) The analysis shall be performed under worst-case Arc-Flash conditions, and the final report shall describe, when applicable, how these conditions differ from worst-case bolted fault conditions.

6) The Arc-Flash Hazard Analysis shall be performed by a registered professional engineer.

7) The Arc-Flash Hazard Analysis shall be performed in compliance with IEEE Standard 1584-2005, the IEEE *Guide for Performing Arc-Flash Calculations*.

8) The Arc-Flash Hazard Analysis shall include recommendations for reducing AFIE levels and enhancing worker safety.

9) The proposed vendor shall demonstrate experience with Arc-Flash Hazard Analysis by submitting names of at least ten actual Arc-Flash Hazard Analyses it has performed in the past year.

10) The proposed vendor shall demonstrate capabilities in providing equipment, services, and training to reduce Arc-Flash exposure and train workers in accordance with NFPA 70E and other applicable standards.

11) The proposed vendor shall demonstrate experience in providing equipment labels in compliance with NEC-2017 section 110 and ANSI Z535.4 to identify AFIE and appropriate Personal Protective Equipment classes.

12) The proposed vendor shall provide arc flash incident energy labels to the electrical contractor so that they can be affixed to the equipment.

13) Upon completion of the final model, the contractor shall turn over the model (digital file) as part of project closeout.

END OF SECTION 26 05 73.10

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SECTION 26 09 23- LIGHTING CONTROL DEVICES

A. GENERAL

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.

2. SUMMARY

   a. This Section includes occupancy sensors, and multipole lighting relays and contactors.

   b. Related Sections include the following:

      1) Division 26 Section "Wiring Devices" for wall-box dimmers and manual light switches.

3. SUBMITTALS

   a. Product Data: Include dimensions and data on features, components, and ratings for lighting control devices.

   b. Shop Drawings: For relay lighting control panels include riser diagram, panel schedules, and switch schedules. Riser diagram shall include panel interconnections, switch control links, and switch addresses and locations.

   c. Samples: Occupancy sensors for color selection and evaluation of technical features.

   d. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

   e. Maintenance Data: For lighting control devices to include in maintenance manuals specified in Division 1. Include installation and programming manuals for relay lighting control system.

4. QUALITY ASSURANCE

   a. Source Limitations: Obtain lighting control devices from a single source with total responsibility for compatibility of lighting control system components specified in this Section.

   b. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, for their indicated use and installation conditions by a testing agency acceptable to authorities having jurisdiction.

   c. Comply with 47 CFR 15, Subparts A and B, for Class A digital devices.

   d. Comply with NFPA 70.

5. COORDINATION

   a. Coordinate features of devices specified in this Section with systems and components specified in other Sections to form an integrated system of compatible components. Match components and interconnections for optimum performance of specified functions.

B. PRODUCTS

1. MANUFACTURERS

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Contactors and Relays:

a) Cutler-Hammer Products; Eaton Corporation
b) GE Lighting Controls
c) Siemens Energy and Automation, Inc.
d) Square D Co.; (preferred manufacturer, refer to Architects Section 01 23 00.)

2) Occupancy Sensors:

a) Hubbell Lighting, Inc.
b) Acuity
c) Watt Stopper, Inc. (The)

2. LIGHTING OVERRIDE SWITCHES (By HVAC Control Contractor)

a. Provide two button low voltage override switches where shown on plans.

b. Override switches shall be tied directly into the building's BAS system. Provide switches compatible with the BAS.

c. Override switches shall be programmed as indicated below. Coordinate closely with controls contractor.

1) BAS shall be programmed to turn OFF common area and corridor lights as indicated on the drawings based on a set time schedule. Coordinate with owner for desired ON/OFF time schedule including programming for holidays, weekends and special events.

2) Fifteen minutes prior to an impending OFF event, the BAS shall send a signal to the lighting contractor to blink the lights on and off three times in two second intervals.

3) If override buttons are pressed prior to the blink warning, they shall have no effect.

4) If the ON override button is pressed during the fifteen minutes after a blink warning, the scheduled OFF event shall be extended for two hours. If the OFF button is pressed after the schedule has been extended, it shall initiate a blink warning and fifteen minute countdown to an impending OFF. Pressing the OFF button multiple times after the blink warning has been activated has no effect.

5) Pressing the ON button at any time during an OFF scheduled time or 15 minute blink warning period shall override the schedule for a two hour period. After that two hour period if the normal schedule is still OFF, the fifteen minute blink warning shall be activated. If the normal schedule is ON the lights stay ON.

3. GENERAL LIGHTING CONTROL DEVICE REQUIREMENTS

a. Line-Voltage Surge Protection: Include in all 120- and 277-V solid-state equipment. Comply with UL 1449 and with ANSI C62.41 for Category A locations.

4. OCCUPANCY SENSORS

a. Wall or Ceiling-Mounting Units: Unit receives control power from a separately mounted auxiliary power and control unit and operates power switching contacts in that unit.

b. Switch-Box-Mounting Units: Unit receives power directly from switch leg of the 120- or 277-V ac circuit it controls and operates integral power switching contacts rated 800 W at 120-V ac, and 1000 W at 277-V ac, minimum.

c. Operation: Turns lights on when room or covered area is occupied and off when unoccupied, unless otherwise indicated.

6) Time Delay for Turning Lights Off: Adjustable over a range from 1 to 15 minutes, minimum. (Set to 15 minutes)

1) Manual Override Switch: Turns lights off manually regardless of elapsed time delay.

2) Ambient-Light-Level Control: Adjustable for setting a level of ambient illumination above which sensor will not turn lights on when occupancy is sensed.

d. Auxiliary Power and Control Units: As follows:

1) Relays rated for a minimum of 20-A normal ballast load or 13-A tungsten filament or high-inrush ballast load.

2) Sensor Power Supply: Rated to supply the number of connected sensors.

e. Dual-Technology Type: Uses a combination of passive-infrared and ultrasonic detection methods to distinguish between occupied and unoccupied conditions for area covered. Particular technology or combination of technologies that controls each function (on or off) is selectable in the field by operating controls on unit.

5. MULTIPOLE CONTACTORS AND RELAYS (Refer to Architects Alternate List Section 01 23 00)

a. Description: Electrically operated, normally closed, and electrically held, and complying with UL 508 and NEMA ICS 2.

1) Current Rating for Switching: UL listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballasts with 15 percent or less total harmonic distortion of normal load current).

2) Control Coil Voltage: Match control power source.

C. EXECUTION

1. INSTALLATION

a. Install equipment level and plumb and according to manufacturer's written instructions.

b. Mount lighting control devices according to manufacturer's written instructions and requirements in Division 26 Sections.

c. Mounting heights indicated are to bottom of unit for suspended devices and to center of unit for wall-mounting devices.

2. CONTROL WIRING INSTALLATION

a. Install wiring between sensing and control devices according to manufacturer's written instructions.

b. Wiring Method: Install all wiring in raceway as specified in Division 26 Section "Raceways and Boxes," unless run in accessible ceiling space and gypsum board partitions.

c. Bundle, train, and support wiring in enclosures.

d. Ground equipment.

e. Connections: 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.

3. IDENTIFICATION

a. Identify components and power and control wiring according to Division 26 Section "Electrical General Provisions"

4. FIELD QUALITY CONTROL

a. Schedule visual and mechanical inspections and electrical tests with at least seven days' advance notice.

b. Inspect control components for defects and physical damage, testing laboratory labeling, and nameplate compliance with the Contract Documents.

c. Check tightness of electrical connections with torque wrench calibrated within previous six months. Use manufacturers recommended torque values.

d. Verify settings of photoelectric devices with photometer calibrated within previous six months.

e. Electrical Tests: Use particular caution when testing devices containing solid-state components. Perform the following according to manufacturer's written instructions:

1) Continuity tests of circuits.

2) Operational Tests: Set and operate devices to demonstrate their functions and capabilities in a methodical sequence that cues and reproduces actual operating functions.

a) Include testing of devices under conditions that simulate actual operational conditions. Record control settings, operations, cues, and functional observations.

f. Correct deficiencies, make necessary adjustments, and retest. Verify that specified requirements are met.

g. Test Labeling: After satisfactory completion of tests and inspections, apply a label to tested components indicating test results, date, and responsible agency and representative.

h. Reports: Written reports of tests and observations. Record defective materials and workmanship and unsatisfactory test results. Record repairs and adjustments.

5. CLEANING

a. Cleaning: Clean equipment and devices internally and externally using methods and materials recommended by manufacturers, and repair damaged finishes.

6. DEMONSTRATION

a. Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:

1) Train Owner's maintenance personnel on troubleshooting, servicing, adjusting, and preventive maintenance. Provide a minimum of three hours' training.

2) Training Aid: Use the approved final version of maintenance manuals as a training aid.

3) Schedule training with Owner, through Architect, with at least seven days' advance notice.

7. ON-SITE ASSISTANCE

    a. Occupancy Adjustments: Within one year of date of Substantial Completion, provide up to three Project site visits, when requested, to adjust light levels, make program changes, and adjust sensors and controls to suit actual conditions.

END OF SECTION 26 09 23

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SECTION 26 22 00 – DRY TYPE TRANSFORMERS

A. GENERAL

1. The Electrical Contractor shall provide dry type transformer(s) of the size and type as shown on the engineering plans.

2. Transformer(s) shall be manufactured by Square D or approved equivalents by Siemens, Eaton or General Electric. Refer to Architects Preferred Alternate Section 01 23 00.

3. All transformers shall comply with the latest Department of Energy (DOE) efficiency standards. All transformers for this project shall meet or exceed the latest DOE requirements.

B. PRODUCT

1. Transformer(s) shall be 480 volt delta to 120/208 volt, three (3) phase, four (4) wire "Y" of the size(s) shown.

2. Units 15 KVA or larger shall be Class 220 degrees C insulation with 150 degrees C temperature rise above 40 degrees ambient and floor mounted with vibration isolation pads provided. Where floor mounted units are suspended, the type of suspension and vibration isolation shall be as detailed on the plans.

3. Six 2 ½ % taps, two above and four below normal shall be provided.

4. The core of the transformer shall be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable approved testing agency and National Electric Code standards.

5. The maximum temperature of the top of the enclosure shall not exceed 50 degrees C rise above 40 degrees C ambient.

6. All transformer(s) shall be copper wound. Aluminum wound transformers shall not be acceptable.

7. All transformers shall have reduced core flux to compensate for harmonic voltage distortion.

8. Transformers shall have double size neutral terminal for additional customer neutral cables.

9. All dry type transformers shall be general duty type, defined and comply with the latest energy conservation standards.

10. All equipment shall meet UL, NEC and NEMA Standards as applicable to the equipment specified herein.

11. The transformer shall be energy efficient and shall bear the energy star label and meet NEMA TP-1 requirements.

C. EXECUTION

1. Transformer(s) shall be installed in accordance with manufacturer's instructions and in compliance with the National Electric Code.

2. Unit(s) shall be mounted on 4" high concrete pad furnished by the Electrical Contractor. The pad shall be 2500 PSI concrete and the pad size shall be greater than the transformer(s) size by a minimum of 4".

3. Make connections to transformer(s) with a minimum of one (1) foot of flexible conduit.

END OF SECTION 26 22 00

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SECTION 26 24 13 – SERVICE ENTRANCE SWITCHBOARD

A. GENERAL

1. The Electrical Contractor shall provide a main service entrance switchboard as shown on the drawings and as contained herein.

2. The switchboard(s) shall meet Underwriter's Laboratories enclosure requirements and shall be Square 'D', Eaton (Cutler-Hammer), GE, or approved equivalents. Refer to Architects Preferred Alternate section 01 23 00.

3. The switchboard(s) shall be listed and labeled as suitable for use as service entrance equipment.

4. Where dimensions are shown on the plans, the switchboard dimensions shall not exceed those shown.

B. PRODUCT

1. Enclosure Construction

   a. The switchboard framework shall be fabricated on a die-formed steel base or base assembly consisting of formed steel and commercial channel welded or bolted together to rigidly support the entire shipping unit for moving on rollers and floor mounting. The framework is to be formed code gauge steel, rigidly welded and bolted together to support all cover plates, bussing, and component devices during shipment and installation.

   b. Each switchboard section shall have an open bottom and individual removable top plate for installation and termination of conduit. Top and bottom conduit area is to be clearly shown and dimensioned on the shop drawings. The wireway front covers are to be hinged to permit access to the branch switch load side terminals without removing the covers. All front plates used for mounting meters, selector switches or other front mounted devices shall be hinged with all wiring installed and laced with flexibility at the hinged side. All closure plates shall be screw removable and small enough for each handling by one man. The paint finish shall be gray enamel over a rust-inhibiting phosphate primer.

   c. The enclosure shall be front accessible.

2. Bussing

   a. The switchboard bussing shall be copper with silver plating and of sufficient cross-sectional area to continuously conduct rated full load current with a maximum temperature rise of 50 degrees Celsius, above an ambient temperature of 30 degrees Celsius.

   b. The main horizontal bus bars between sections shall be located on the back of the switchboard to permit a maximum of available conduit area. Bus bars in the distribution section shall be of full length, to allow for future addition of circuit breakers up to the maximum number allowable for this size switchboard. The horizontal main bus bar supports, connections, and joints are to be bolted with grade 5 carriage bolts and Belleville washers to be free of required periodic maintenance.

   c. Switchboards shall be provided with an adhesive tape on front of enclosure to depict actual bus arrangement inside cubicles.

3. Integrated Equipment Rating

a. The bus bars shall be rigidly braced for 100,000 amp fault current interrupting capacity (symmetrical), or as shown on the plans.

b. Each switchboard, as a complete unit, shall be given a single integrated equipment rating by the manufacturer. The integrated equipment short-circuit rating shall certify that all equipment is capable of withstanding the stresses of a fault equal to that of the least overcurrent protective device contained therein or as specified. Such rating shall be established by actual tests by the manufacturer on a similar equipment construction as the subject switchboard. This test data shall be available and shall be furnished to the Engineer with the submittal of approval drawings.

4. Main Circuit Breakers

a. Unless otherwise noted, the main service disconnect shall be a solid state trip circuit breaker of the following type:

3000 Amp Switchboard = Type SE-LSG (100% rated)
2500 Amp Switchboard & Less = Type PX-LSG (100% rated)

All main breakers for switchboards shall be provided with trip indication integral to the breaker. All main breakers shall be provided with ground fault protection. The size shall be provided as shown on the plans. All trip adjustments shall be factory coordinated and set with the secondary breakers within the switchboard.

b. All breakers 1200 Amps or higher shall be provided with Arc Energy Reduction as per NEC 2014 Section 240-87.

5. Ground Fault Protection

a. The ground fault protection system shall include a current sensor and appropriate relaying equipment. The current sensor shall enclose all phase (and neutral, if present) conductors of the circuit to be monitored. The current sensor frame shall be so constructed that one leg can be opened to allow removal or installation around cables or bussing without disturbing the cables or requiring drop-links in the bussing. A test winding shall be provided to simulate the flow of ground fault current through the current sensor, in order to test the complete system including sensor pick-up, relaying equipment and electric trip mechanism of the switch.

b. The ground fault relay shall be solid construction and have adjustable pick-up for ground fault currents from 200 amperes to 1200 amperes. Settings for individual relays shall be 200 amperes. Time delay provided by the ground fault relay circuitry shall be nominally .5 seconds and shall be permanently calibrated to preclude tampering with the time delay after installation.

6. Molded Case Circuit Breakers

a. All devices shall be listed and meet the latest version, as of the bid date, of NEMA Standards, Publication No. AB1.

b. The breakers shall be quick-make and quick-break type. The breakers shall have wiping type contacts, arc chutes and common trip mechanisms for three pole breakers.

c. All breakers shall be calibrated for operation in an ambient temperature of 40 degrees Celsius.

d. All breakers shall be of the minimum interrupting rating specified and of the trip size shown on the plans.

e. All breakers 400 ampere and larger shall be solid-state trip type.

7. An electronic metering package shall be included with this switchboard. Eaton (Cutler-Hammer) IQ Data Plus, Square D PowerLogic, General Electric PQM Series, or equivalent.

8. Additional Features

   a. Factory finish gray paint application.

   b. Commercial channel base.

C. EXECUTION

1. The switchboard(s) shall remain in the manufacturer's container(s) until such time that the unit(s) can be set and assembled. Once the equipment has been received at the job site, it shall be stored to prevent physical damage from weather or construction.

2. Provide a 4" thick concrete pad with leveling channels in the floor construction for mounting of the switchboard.

3. The manufacturer's representatives shall inspect the equipment after installation and certify in writing to the Engineer that the equipment had been installed in accordance with the manufacturer's recommendations. In addition, the operation of all devices shall be checked by the manufacturer's representative in the presence of the Engineer.

4. Each switchboard component shall be provided with adequate nameplate on front of cubicle (see Electrical General Provisions Section for equipment identification).

5. A Coordination Study, as per section 26 05 73.10 shall be completed and submitted by manufacturer as part of shop drawing submittals.

6. The manufacturer shall test the main breaker, and adjust all settings in accordance with the Coordination Study. This information shall be documented and turned over to the Engineer as part of final turnover. If nuisance tripping occurs, the manufacturer shall be responsible for identifying problem and readjusting settings.

7. Upon completion of installation, and prior to final inspection, the Contractor shall reduce in size the “as-built” single line diagram (riser), frame same under glass, and mount in a conspicuous place adjacent to the switchboard.

8. The Flash Protection Boundary and Incident Energy for the electrical equipment shall be identified by the manufacturer in accordance with IEEE 1584 and NFPA 70E and clearly marked and located so that it is clearly visible to qualified personnel before any examination, adjustments, servicing or maintenance is made to the equipment.

END OF SECTION 26 24 13

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SECTION 26 24 16 – PANELBOARDS AND CIRCUIT BREAKERS

A. GENERAL

1. The Electrical Contractor shall provide all panelboards and circuit breakers as shown on the plans in accordance with this specification. Refer to Architects Preferred Alternate section 01 23 00.

2. All equipment shall meet a third party agency accredited by the NCBCC, NEC and NEMA Standards as applicable to the equipment specified herein.

3. All panelboards shall be equipped with a main circuit breaker or main lugs as indicated on the drawings.

4. All panelboards shall be equipped with branch breakers as shown on the drawings. Maximum number of breakers in a panelboard shall not exceed 42 poles unless otherwise noted on plans.

5. All panelboards identified on the drawings for use as service equipment shall be so labeled and listed for such use by a third party agency accredited by the NCBCC.

6. Full size insulated copper neutral bars shall be included in all panelboards. Neutral bussing and ground bussing shall have suitable lugs for outgoing "branch circuits" or 50% of the breaker poles furnished in the panelboard.

7. A full size copper ground bus and copper neutral bus shall be included in all panelboards sized for 100% terminations.

8. All current-carrying parts of the bus assembly shall be copper.

9. Panelboards shall be labeled with a third party accredited by the NCBCC short circuit rating not less than the rating indicated on the drawings. Circuit breakers shall be fully rated for the amount shown on the plans. Series rating of the circuit breaker is not allowed.

10. The word "spare", unless noted otherwise on the panel schedules, shall be a single pole, 20 amp circuit breaker.

11. The word "space", unless noted otherwise on the panel schedules, shall be for a space in the panelboard for a standard size, single pole circuit breaker.

12. Terminals for feeder conductors to the panelboard mains and neutral shall be listed as suitable for the type of conductor specified by a third party agency accredited by the NCBCC. Terminals for branch circuit wiring, both breaker and neutral, shall be UL listed as suitable for the type of conductor specified.

13. Feed-thru panels are not permitted unless otherwise indicated.

14. The use of series-rated breakers is not acceptable.

15. “Load Centers” are not acceptable.

16. Flash protection boundary and the incident energy for the electrical equipment shall be determined in accordance with IEEE 1584 and NFPA 70E requirements. Provide "arc flashing" warning labels on all power panels, enclosed circuit breakers, and other equipment where required by NFPA 70E.

17. Contractor shall be responsible for providing a log of all new feeder conductor sizes and lengths to the Engineer for inclusion in the Arc-flash study. See specification 26 05 73.10

18. Panelboard fronts shall be of code gauge, full finished steel with rust-inhibiting primer and ANSI 49 gray baked enamel finish. Panelboard fronts shall be 1-piece full length piano hinged trim type

construction, flush or surface mounted as indicated. Panelboard fronts shall include doors and have flush, brushed stainless steel, cylinder tumbler-type locks with catches and spring- loaded door pulls. The lock shall not protrude beyond the front of the door. All panelboard locks shall be keyed alike. Doors over 48" long shall be equipped with three-point latch and vault lock. A circuit directory frame with a clear plastic covering and a directory card shall be provided on the inside of the door.

19. The number of the branch circuit shall be identified with permanent wire tag attached to the wire.

20. Circuit breakers feeding sleeping areas, such as dorms, shall be arc fault.

21. Branch circuits shall have individual neutrals, no sharing of the neutrals between circuits.

B. PRODUCT

1. This section shall be for panelboards whose characteristics shall not exceed the following:

Voltage = 240		Maximum Branch Circuit	= 225 amps
Amps = 600		Short Circuit Rating	= 22,000 amps

   a. Panelboards shall be Square D Company type NQOD (bolt-on) or approved equivalent by Eaton (Cutler Hammer), or General Electric, and shall be door in door type construction.

   b. Bus bar connections to the branch circuit breakers shall be the "distributed phase" or "phase sequence" type.

   c. The panelboard bus assembly shall be enclosed in a steel cabinet. The size of the wiring gutters and gauge of steel shall be in accordance with NEMA, a third party agency accredited by the NCBCC, and National Electrical Code requirements for panelboards. The box shall be fabricated from galvanized steel or equivalent rust-resistant steel. Surface mounted cans shall be galvanized and without preformed knockouts.

   d. Fronts shall include doors and have flush, brushed stainless steel, cylinder tumbler-type locks with catches and spring- loaded door pulls. The flush lock shall not protrude beyond the front of the door. All panelboard locks shall be keyed alike. All panelboards shall have fronts trim with 1-piece “door in door” type construction to allow access to the panel gutter without removal of the entire panel cover, available flush or surface mounted as scheduled, ANSI 49 gray. Fronts shall not be removable with door in the locked position. A circuit directory frame with a clear plastic covering and a directory card shall be provided on the inside of the door. Fronts shall be of code gauge, full finished steel with rust-inhibiting primer and baked enamel finish. Circuit information on directory cards shall be neatly typed or computer generated.

   e. Panelboard trims shall cover all live parts. Switching device handles shall be accessible.

2. This section shall be for panelboards whose characteristics shall not exceed the following:

Voltage = 480		Maximum Branch Circuit	= 225 amps
Amps = 600		Short Circuit Rating	= 18,000 amps 480 VAC 65,000 amps 240 VAC

   a. Panelboards shall be Square D Company Type NF (bolt-on) or approved equivalent by Eaton (Cutler Hammer), or General Electric.

   b. Bus bar connections to the branch circuit breakers shall be the "distributed phase" or "phase sequence" type.

   c. The panelboard bus assembly shall be enclosed in a steel cabinet. The size of the wiring gutters and gauge of steel shall be in accordance with NEMA, a third party agency accredited by the NCBCC, and National Electrical Code requirements for panelboards. The box shall be

fabricated from galvanized steel or equivalent rust-resistant steel. Surface mounted cans shall be galvanized and without preformed knockouts.

d. Fronts shall include doors and have flush, brushed stainless steel, cylinder tumbler-type locks with catches and spring-loaded door pulls. The flush lock shall not protrude beyond the front of the door. All panelboard locks shall be keyed alike. All panelboards shall have fronts trim with 1-piece “door in door” type construction to allow access to the panel gutter without removal of the entire panel cover, available flush or surface mounted as scheduled, ANSI 49 gray Fronts shall not be removable with door in the locked position. A circuit directory frame with a clear plastic covering and a directory card shall be provided on the inside of the door. Fronts shall be of code gauge, full finished steel with rust-inhibiting primer and baked enamel finish. Circuit information on directory cards shall be neatly typed or computer generated.

e. Panelboard trims shall cover all live parts. Switching device handles shall be accessible.

3. This section shall be for panelboards whose characteristics shall not exceed the following:

Voltage:	480	Maximum Branch Circuit =	1,200 Amps
Amps:	1200	Short Circuit Rating =	200,000 Amps

a. Panelboards shall be Square D Company, Type I-Line or approved equivalent by Eaton (Cutler Hammer), or General Electric.

b. Panelboard assembly shall be enclosed in a steel cabinet. The rigidity and gauge of steel to be as specified in UL Standard 50 for cabinets. The size of wiring gutters shall be in accordance with NEMA, a third party agency accredited by the NCBCC, and NEC Standards for panelboards. Cabinets to be equipped with spring latch and tumbler-lock on door of trim. Doors over 48" long shall be equipped with three-point latch and vault lock. All locks shall be keyed alike. Endwalls shall be removable. Fronts shall be of code gauge, full finished steel with rust inhibiting primer and baked enamel finish.

c. The panelboard interior assembly shall be dead front with panelboard front removed. Main lugs or main breaker shall be barriered on five sides. The barrier in front of the main lugs shall be hinged to a fixed part of the interior. The end of the bus structure opposite the mains shall be barriered.

d. A circuit directory frame with a clear plastic covering and a directory card shall be provided on the inside of the door. Circuit information on directory cards shall be neatly typed or computer generated.

e. All breakers 1200 Amps or higher shall be provided with Arc Energy Reduction as per NEC 2014 Section 240-87.

4. Molded Case Circuit Breakers

a. This specification covers molded case circuit breakers rated 15 through 225 amperes 120VAC, 240VAC, 277VAC, and 480VAC. Any breaker 100 A and larger shall have an adjustable instantaneous setting. Any breakers larger than 225 amp shall be adjustable trip type with long time, short time, instantaneous, I^{2T} settings. Each setting listed shall have individually adjustable dials.

Breakers covered under this specification may be installed in switchboards, panelboards, motor control centers, combination motor starters, busway plugs and individual enclosures.

b. All breaker information shall be visible and adjustable as installed without removal of enclosure cover.

c. Circuit breakers shall be manufactured by Square D Company of the size as indicated on the drawings or approved equivalent by Cutler Hammer, or General Electric.

d. All circuit breakers shall have a bolt-on, quick-break over center toggle type mechanism. The handle mechanism shall be trip-free to prevent holding contacts closed against a short circuit or sustained overload. All circuit breakers shall assume a position between on and off when tripped automatically. Multi-pole circuit breakers shall be common trip such that an overload or short circuit on any one pole will result in all poles opening simultaneously. Arc extinction is to be accomplished by magnetic arc chutes. All ratings shall be clearly visible.

e. Automatic operation of all circuit breakers shall be obtained by means of thermal-magnetic tripping devices located in each pole providing inverse time delay and instantaneous circuit protection. Circuit breakers shall be calibrated to carry 100% rated current in an ambient of 40 degrees Celsius. Circuit breakers shall be ambient compensating in that, as the ambient temperature increases over 40 degrees Celsius, the circuit breaker automatically derates itself so as to better protect its associated conductor. The instantaneous magnetic trip shall be adjustable and accessible from the front of all circuit breakers on frame sizes 250 amps and above.

f. The interrupting rating of each circuit breaker shall be as indicated on the drawings. The interrupting rating of the circuit breakers shall be at least equal to the available short circuit current at the line terminals of the circuit breaker and correspond to UL listed integrated short circuit current rating specified for the panelboards and switchboards.

g. UL Class A (5 milliampere sensitivity) ground fault circuit protection shall be provided on 120 V ac branch circuits as specified on the plans or panelboard schedule. This protection shall be an integral part of the branch circuit breaker which also provides overload and short circuit protection for branch circuit wiring. Tripping of a branch circuit containing ground fault circuit interruption shall not disturb the feeder circuit to the panelboard. A single pole circuit breaker with integral ground fault circuit interruption shall require no more panelboard branch circuit space than a conventional single pole circuit breaker.

h. Motor starters, and other applications as indicated on drawings, shall be furnished with magnetic-only type molded case circuit breakers. Each breaker shall be provided with a single magnetic adjustment that will set all poles to the same trip current. Adjustment shall be continuous throughout the adjustable trip range. The magnetic trips shall be accessible from the front of these circuit breakers.

C. EXECUTION

1. Panelboards shall be flush or surface mounted as shown on the plans.

2. Panel enclosures shall not be used as junction or pull boxes for splicing conductors.

3. Each flush mounted panel shall be equipped with two empty one inch conduits sealed in the wall from a panel to a six inch square flush mounted box installed above a lay-in type ceiling or flush in the wall at the ceiling for a plaster or spline type acoustical tile ceiling.

4. All panels shall be equipped with circuit information directory cards. Directory cards shall be neatly typed or computer generated and attached on the inside of the door. Directory notations shall include room number (using signage designations where available) that branch circuit serves.

5. GFI circuits shall be tested by the Contractor prior to the pre-final inspection.

6. An engraved nameplate shall be provided for each panel. See Specification Section 26 01 00 (Electrical General Provisions).

END OF SECTION 26 24 16

SECTION 26 27 26 – WIRING DEVICES

A. GENERAL

1. Switches, dimmer switches, photocell, contactors and receptacles, with proper cover plates, shall be provided where indicated on the Drawings.

2. All devices shall be labeled for its particular application.

B. PRODUCT

1. All wiring devices shall be as specified in the Symbol Legend of the Drawings.

2. Toggle switches shall be single pole, three-way, or four-way as indicated on the drawings. Switches shall be of the grounding type, with hex-head grounding screw, rated 20A, 120/277 volt, AC only. Lighted handle switches shall have neon lights of the correct voltage rating where indicated on the drawings. All switches shall have quiet operating mechanisms without the use of mercury switches. All switches shall be listed by an “approved” third-party agency, approved for the voltage and amperage indicated.

3. When the Contractor proposes to use a different wiring device than the one specified in the Symbol Legend of the Drawings, he shall submit one of the following manufacture's devices for approval:

   a. Dimmer Switches: Lutron, Leviton, or Pass & Seymour.

   b. Industrial Specification Heavy Duty Grade Receptacles: Hubbell Hubbell-pro series or equals by: Leviton or Pass & Seymour.

4. Duplex receptacles shall be of the grounding type, arranged for back and side wiring, with separate single or double grounding terminals. Receptacles shall be straight blade, rated 20A, 125 volt and the face configuration shall conform to the NEMA Standard No. WD-1, NEMA WD-6, DSCC W-C-596G and UL-498, and shall be “approved” third-party listed. Self-grounding or automatic type grounding receptacles are not acceptable in lieu of receptacles with separate grounding screw lugs and a direct, green insulated conductor connection to the equipment grounding system.

5. Receptacles shall be industrial specification heavy duty grade mounted vertically. Receptacles mounted over counter, backsplashes, etc shall be mounted horizontally.

6. Cover plates for all wall mounted devices shall be provided as scheduled on the Drawings. Where covers are not specified, they shall be stainless steel and furnished to match the field conditions and outlets provided.

7. All cover plates for all devices shall have the circuit designation serving the device written on the back of the cover plate with a permanent marker.

8. All cover plates shall be semi-jumbo (midi size) as opposed to standard size plates.

9. All stainless steel cover plates shall be 302 alloy, non-magnetic and non-corrosive.

10. Unless specifically noted otherwise on the plans, all dimmer switches (indicated by the Symbol S_D) shall be a slide type dimmer with a toggle preset, sized to handle the switched load.

11. Receptacles in wet locations shall be weather-resistant type extra heavy duty "In-use" type, installed with a hinged outlet cover/enclosure clearly marked “Suitable for Wet Locations While In Use" and "UL Listed". There must be a gasket between the enclosure and the mounting

surface, and between the hinged cover and mounting plate/base to assure proper seal. TayMac, Hubbell, Leviton, heavy-duty grade, or approved equivalents.

12. At the end of the project, spare cover plates shall be turned over to the Owner. The quantity shall be equal to 2% of each type installed on the project.

13. Switch and receptacle cover plates on exposed work shall be galvanized cast ferrous metal, standard size, and shall be single or ganged as indicated on the drawings.

C. EXECUTION

1. Mounting height shall be as indicated on the Drawings. Coordinate with other trades so that devices will miss equipment installed by others.

2. Receptacles shall be industrial specification grade or heavy-duty grade, mounted vertically. Receptacles mounted over counters, back-splashes, etc., shall be mounted horizontally.

3. Special wiring devices shall be shown on the drawings with complete description thereof.

4. GFCI receptacles shall be rated minimum 20 amp (NEMA 5-20R configuration).

5. GFCI receptacles shall be provided where installed to serve countertop and are located within 6 feet of a sink.

6. Where two or more devices are ganged, they shall be in a common box with a ganged plate.

7. All receptacles shall have a green ground conductor to run parallel with the phase conductor back to the electrical panel.

8. Breakers feeding sleeping areas shall be arc fault type.

9. Arc fault receptacles shall be provided for “dormitory” use as required per NEC.

10. Receptacles shall not be mounted back to back.

11. In all areas where carpet is to be installed as finished floor material, unless otherwise specified, the Electrical Contractor will furnish solid brass carpet flanges for installation on floor outlet boxes. Flanges will be furnished and installed on all active outlets after the carpet is installed. Where a specified number of outlet fittings are to be furnished to the Owner, for each fitting not installed during the construction period, it will be turned over to the Owner with the receptacle, carpet flange and all necessary appurtenances.

12. All wiring devices shall be 20 amp minimum and shall be of the grounding type, with hex-head green grounding screw, to be connected to the green ground conductor. Self-grounding type is not acceptable.

END OF SECTION 26 27 26

SECTION 26 28 16 – DISCONNECTS

A. GENERAL

1. Disconnect switches shall be provided where indicated on the drawings, or as required by the National Electrical Code (NEC). Refer to Architects Preferred Alternates section 01 23 00.

B. PRODUCT

1. Safety switches shall be the “heavy duty” type. General duty switches are not acceptable.
2. Safety switches shall be third-party listed.
3. Disconnects shall be furnished with factory finish paint and appropriate knockouts for conduit connections.
4. Front operated handles will not be permitted.
5. All fused disconnects shall be equipped with positive pressure fuse clips and shall have visible disconnecting blade switches.
6. Fuse size shall be coordinated with final equipment served.
7. NEMA 1 enclosures shall be provided where installed indoors. NEMA 3R enclosures shall be provided where exposed to the elements, unless noted otherwise.
8. Switches shall have defeatable door interlocks that prevent the door from opening when the operating handle is in the “on’ position.
9. Switches shall be capable of being padlocked in the “on” or “off” position.
10. Switches shall have non-teasible, positive, quick make-quick break mechanisms.
11. Switches shall be properly labeled. See Section “General Provisions” - Electrical Identification, Paragraph B.2.
12. Elevator Disconnect Switch shall consist of a fused disconnect switch with integral shunt trip device. The shunt trip device shall be activated by the closing of a 120VAC dry contact controlled via the fire alarm system. The elevator disconnect switch shall also have a voltage monitoring relay that monitors power to shunt trip device and is supervised by the fire alarm system.
13. The elevator disconnect switch shall be provided in a single enclosure with all necessary switching mechanism, shunt-trip device, fuse holders, relay(s), control transformer and other electrical components required for a complete listed system. Refer to the drawings for switch size. Fuse rating of the switch shall be based upon elevator manufacturer requirements. The elevator disconnect switch shall include as an accessory, a 100VA control power transformer with primary and secondary fuses and shall also contain an isolation relay with a 120VAC coil. A normally open dry contact shall be provided by the Fire Alarm System to energize the isolation relay and activate the shunt trip solenoid. The module shall contain a Key to Test Switch, a green “ON” Pilot Light, One set of Auxiliary Mechanical Interlocked Form C contacts, and Fire Alarm Voltage Monitoring Relay. Refer to wiring diagram on drawings.

C. EXECUTION

1. Disconnect switches shall be mounted as indicated on the Drawings and shall be independently supported. Conduits entering the disconnect switch shall not be used to support switches.

2. Where fused disconnect switches are required or shown on the plans, fuse selection shall be per the following table:

Circuit Type	Fuse Type
Service Entrance & Feeder Circuits over 600 Amp	Class L, UL listed, current limiting with 200K Amp Interrupting rating.
Service Entrance & Feeder Conduits 600 Amp or less	Class RK1, or J, UL listed, current limiting with 200K Amp Interrupting rating.
Motor, Motor Controller, and Transformer Circuits	Class RK5, UL listed, current limiting time delay, with 200 K Amp Interrupting rating
Individual Equipment where Fault Current does not exceed 50KA	Class K5, UL listed, with 50 KA Interrupting rating

3. Fusible safety switches with short-circuit withstand ratings of 100K Amp or 200K Amp require Class R or Class J rejection fuse block feature.

4. Electrical contractor shall provide spare fuses for each equipment requiring fuses.

END OF SECTION 26 28 16

DIVISION 26 32 01 – STANDBY POWER GENERATOR SET – BASE BID

A. GENERAL

1. The Contractor shall furnish a standby power generator set as indicted on the drawings and contained herein. The contractor shall supply all parts for a complete, functioning generator set.
2. All materials, equipment, and parts comprising the units specified herein, shall be new and unused, of current manufacture and of highest grade.
3. The engine, generator and all major items of auxiliary equipment shall be manufactured by manufacturers currently engaged in production of such equipment. The unit shall be furnished by an authorized dealer having a parts and service facility within 150 miles of the project site.
4. The generator set shall be as manufactured by Caterpillar, Cummins, Kohler, or Generac and shall meet the requirements of UL2200 listing, NFPA 110.

B. PRODUCT

1. Generator Set Characteristics
   a. Acceptable Unit: 150 REOZJB or approved equivalent.
   b. Rating at 1800 RPM. The rating of the engine-generator system shall be based on operation of the set when equipped with all necessary operating accessories such as radiator fan, air cleaners, etc.
      1) Standby power KW with fan: 200 KW
      2) Standby power KVA with fan: 250 KVA
      3) Voltage: 277/480, 3 phase, 4W
      4) Power Factor: .8
      5) Frequency: 60 hertz
   c. These ratings must be substantiated by manufacturer's standard published curves. Special ratings or maximum ratings are not acceptable.
   d. Set shall be capable of continuous operation for a minimum period of 30 days without damage at the standby rating.
2. Engine
   a. Burner Oil: The engine shall be water cooled inline or Vee-type, four cycle compression ignition diesel. It shall meet specifications when operation on No. 2 domestic burner oil (ASTM D396). Diesel engines requiring premium fuels will not be considered. The engine shall be equipped with fuel, lube oil, and intake air filters, lube oil cooler, fuel transfer pump (if needed), fuel priming pump, water pump, secondary fuel filter, water separator, fuel shut-off solenoid, and all piping and appurtenances required for a complete system.
   b. The engine governor shall maintain frequency regulation not to exceed 2% from no load to full rated load.
   c. The unit shall be mounted on a structural steel sub-base and shall be provided with spring-type vibration isolators with an operating efficiency of at least 90%.
   d. Safety shut-offs for high water temperature, low oil pressure, overspeed, and engine overcrank shall be provided.

3. Generator

   a. The generator shall be a salient pole brushless, synchronous alternator, continuous rated, .8 P.F., 62.5 KVA, 50 KW. The unit shall be the single bearing type. This assembly shall be compact, sturdy and free from vibration and with a minimum noise level. The generator rotating speed shall not exceed 1800 revolutions per minute.

   b. The generator insulation shall be Class “H” the field shall be equipped with a full amortisseur winding designed for an output of three phase, 60 hertz, 120 volts and shall have an overload capacity of 25% for two (2) hours out of twenty-four (24) hour period.

   c. The generator-exciter-regulator package shall provide a voltage regulation of plus and minus 1% of rated voltage. Voltage regulation shall apply to any load from no load to rated load to rated power factor, and is defined as a change in the output voltage after all transients, due to load change, have decayed to zero.

   d. With the generator operating at rated speed, rated voltage, non-load, the sudden application of rated load, rated power factor shall not cause a transient voltage deviation of more than 15% from rated voltage. Following such a sudden load change, the voltage shall recover to and remain within the regulation band within 1.5 seconds.

   e. Amortisseur windings with the end plates connected between poles shall be included for minimized harmonic content, good transient performance and to provide paralleling capability.

   f. The bearings shall be so located as to enable replacement without disturbing the exciter-rectifier-rotor assembly. The generator shaft shall be sufficiently rigid to avoid torsional vibration. The torsional analysis of the shaft shall be done by the engine supplier.

   g. Voltage regulation shall be accomplished by an automatic volts-per-hertz type, solid state, exciter/regulator shock mounted inside the generator.

   h. The generator shall be capable of sustaining at least 250% of rated current for at least 10 seconds under a three-phase symmetrical short by inherent design or by the addition of an optional current boost system.

   i. A resettable line current sensing circuit breaker with inverse time versus current response shall be furnished which protects the generator from damage due to its own high current capability. This breaker shall not trip within the 10 seconds specified above to allow selective tripping of down-stream fuses or circuit breakers under a fault condition. This breaker shall not automatically reset preventing restoration of voltage if maintenance is being performed. Field current-sensing breaker will not be acceptable.

4. Engine Lubricating System.

   a. The engine shall have a lubricating oil pump for supplying oil under pressure to main bearings, crank pin bearings, pistons, piston pins, timing gears, camshaft bearings, and rocker mechanism. Full flow oil filters, conveniently located for servicing, shall be provided. Lube oil drain extensions and valve terminated on the generator base shall be provided.

5. Cooling System

   a. An engine-mounted radiator with blower type fan shall be sized to maintain safe operation at 110 degrees Fahrenheit maximum ambient temperature. The radiator shall be equipped with a duct adapter flange. Air flow restriction from the radiator shall not exceed 0.5” H_20. The contractor shall provide ductwork with flexible connecting section between radiator duct flange and discharge louver frame.

b. One or more dry type air cleaners shall be provided as recommended by the manufacturer.

c. Intake louvers shall be sized and located to provide sufficient intake air for engine combustion, ventilating air, and to provide required air flow through the radiator. These louvers shall be by the Electrical Contractor unless noted otherwise.

d. The engine cooling system shall be filled with a solution of 50% ethylene glycol.

6. Fuel System (Sub-Base Tank)

a. The fuel storage tank, gauges and valves shall be provided and installed by the Electrical Contractor in accordance with appropriate codes and regulations.

b. The tank shall meet EPA and UL 2085 requirements for two hours rating. Tank pressure test shall meet UL142 requirements.

c. The fuel storage tank shall be a sub-base unit of an all-welded construction double wall tank, heavy gauge steel construction prime coated and finished painted outside with leak sensors between the inner and outer walls of the tank.

d. The tank shall be structurally sound to support the entire generator system.

e. The tank shall have a secondary containment of fuel tank and all other accessories.

f. The tank shall be sized for a continuous 24 hour operation of the generator at full load.

g. All pipe connections shall be threaded.

h. The fuel system shall include the following features:

1) Vent
2) Manual Sight Gauge
3) Lockable Fill Cap
4) Lockable Drain for Inner Tank
5) Lockable Drain for Outer Tank
6) Low Fuel Level Alarm to Sound at the Control Panel Upon 4 Hours of Run Time Remaining
7) Inter-tank Leak Detection Alarm to Sound at Control Panel
8) Fuel line check valve

i. Tank shall be full upon completion of the project.

j. The tank vent shall meet NFPA-37 requirements (12-feet above grade level) spill containment.

7. Exhaust System

a. A suitable silencer of the reactive type shall be furnished with the engine. Critical 25-30 DBA reduction.

Provide a critical-grade type silencer including flexible exhaust fitting for remote mounting, properly sized and installed, according to the manufacturer's recommendation. Mounting shall be provided by the installing contractor as shown on the plans and per the manufacturer's standard procedures. Silencer shall be mounted so that its weight is not supported by the engine. Exhaust pipe size shall be sufficient to ensure that measured exhaust back pressure does not exceed the maximum limitations specified by the generator set manufacturer.

b. A stainless steel bellows type exhaust adapter at least 18 inches long shall be furnished for each exhaust outlet to the silencer.

The muffler and all exhaust piping shall be lagged by the installing contractor to maintain a surface temperature not exceed 150 degrees Fahrenheit. The insulation shall be installed so that it does not interfere with the functioning of the flexible exhaust fitting. Insulation outside of the building shall be weatherproof.

8. Automatic Starting System

a. A 12 volt DC electric starting system with positive engagement drive shall be furnished.

b. Fully automatic generator set start/stop controls in the generator control panel shall be provided. Controls shall provide shutdown for low oil pressure, high water temperature, overspeed, overcrank, and one auxiliary contact for activating accessory items. Controls shall include a 30 second single cranking cycle limit with lockout.

c. A unit mounted thermal circulation type water heater shall be furnished to maintain engine jacket water to 90 degrees Fahrenheit in an ambient temperature of 30 degrees Fahrenheit. The heater shall be single phase, 60 hertz, 120 volts. Heater shall be provided with contactor in a rated NEMA enclosure. Heaters shall be disconnected while the engine is running.

9. Batteries

a. The batteries shall be 12 volt maintenance free, lead acid type of suitable capacity to provide 90 seconds of total cranking time at 0 degrees Fahrenheit without recharging and will be rated per manufacturer's recommendation.

b. The battery will be supplied with all necessary intercell and intertray connectors, batter rack, cable, clamps, charged and ready for service.

10. Battery Charger

a. The charger shall be rated at no less than 10 amps and employ transistor controlled magnetic amplifier circuit to provide continuous taper charging.

b. The charger shall maintain rated output voltage with A.C. line fluctuations of +/- 10%.

c. The charger shall contain:

1) Two ranges, float at 1.4 V.P.C. and equalize at 1.6 V.P.C. on maintenance free lead acid batteries.
2) Automatic A.C. line compensation.
3) Automatic overload protection (current limiting).
4) Silicon diode full-wave rectifiers.
5) Automatic surge suppressors.
6) D.C. ammeter and voltmeter.
7) Fused A.C. input and D.C. output.
8) Low D.C. voltage alarm relay.
9) High D.C. voltage alarm relay.

d. A.C. input voltage shall be 120 volt A.C.

11. Generator Control Panel

a. A generator mounted NEMA 1 (or NEMA 12 for outdoor locations) type vibration isolated control panel made from 14 gauge steel shall be provided on the unit, unless otherwise noted. Control panel shall be in accordance with NFPA 110 requirements.

b. Panel shall contain, but not be limited to, the following equipment:

1) Voltmeter, 3 ½", 2% accuracy.
2) Ammeter, 3 ½", 2% accuracy.
3) Ammeter/Voltmeter phase selector switch.
4) Frequency meter, 3 ½", dial type.
5) Automatic starting controls as specified in 7.b.
6) Panel illumination lights and switch.
7) Voltage level adjustment rheostat.
8) Engine oil pressure gauge.
9) Engine water temperature gauge.
10) Dry contacts for remote alarms wired to terminal strips.
11) Fault indicators for low oil pressure, high water temperature, overspeed, overcrank, and not in "auto" position.
12) Four position function switch; "auto", "manual", "off/reset", and "stop".
13) Battery charging ammeter.
14) One set of louver contacts.
15) Tachometer.
16) Running time meter.

12. Main Line Circuit Breaker

a. Two (2) generators mounted fully rated main line molded case circuit breakers with solid state trip units, (rated 100 amps and 200 amps) each shall be installed as a load circuit interrupting and protective device. It shall operate both manually for normal switching function and automatically during overload and short circuit conditions. Shunt trip to activate on engine fault condition.

b. The trip unit for each pole shall have elements providing inverse time delay during overload conditions and instantaneous magnetic tripping for short circuit protection. The circuit breaker shall meet standards established by Underwriters' Laboratories, National Electric Manufacturer's Association, and National Electrical Code.

c. Generator exciter field circuit breakers do not meet the above electrical standards and are unacceptable for line protection.

d. Provide ground fault protection per NEC.

e. Generator circuit breakers shall be third party listed.

13. Annunciator Panel

a. A panel shall be provided for remote mounting to give audible and visual warning of fault or alarm conditions in the generator set.

b. The panel shall conform with the requirements of the National Electrical Code.

c. The panel shall be wall mounted. Field coordinate exact location with the Owner.

14. Pre-Alarm Module

a. A generator control panel mounted pre-alarm module shall be provided to meet NFPA 99.

b. It shall provide audible and visual alarm warning of impending fault conditions and provide audible warning on fault shutdown.

15. Sound Attenuated Weatherproof Engine Enclosure

    a. Sound Attenuation shall not exceed 77 dBA at 23' from enclosure.

    b. Enclosure shall have hinged side doors each side, fixed intake louvers, and metal grille guard on radiator end.

    c. Enclosure and all other items to be designed and built by engine manufacturer as an integral part of the entire generator set and be designed to perform without overheating in the ambient temperature specified.

    d. Constructed of 14-gauge and 16-gauge sheet metal, suitably reinforced to be vibration free in the operating mode.

    e. Four hinged doors provide complete access without their removal.

    f. Each door to have at least two latch-bearing points.

    g. Side and rear panels to be completely and simply removable to major service access.

    h. Locks by padlocks (lock in door handle not suitable).

    i. Roof to be peaked to allow drainage of rain water.

    j. Baked enamel finish with primer and finish coat to be painted before assembly. All fasteners to be rust resistant.

    k. Units shall have sufficient guards to prevent entrance by small animals.

    l. Batteries to fit inside enclosure and alongside the engine.

    m. Unit shall have coolant and oil drains outside the unit to facilitate maintenance. Each drain line is to have a high quality valve located near the fluid source.

    n. Fuel filters must be inside the base perimeter and located so spilled fuel cannot fall on hot parts of the engine or the generator. A cleanable primary fuel strainer shall be used to collect water and sediment between tank and main engine fuel filter.

    o. Crankcase fumes disposal shall not terminate in front of the radiator core and reduce cooling capacity.

    p. Provide a 6" high concrete pad of sufficient size and structure to support the generator and enclosure.

C. EXECUTION

1. The emergency generator, transfer switch(es) and associated equipment shall be warranted by the manufacturer for a period of five (5) years from the date of final inspection and acceptance. The warranty shall be included in the contract documents. The warranty shall include all parts, labor (including travel), expenses and equipment necessary to perform replacement and/or repairs.

2. The generator set shall receive the manufacturer's standard factory load testing. Prior to acceptance of the installation, equipment shall be tested to show that it is free of any defects, and will start automatically, and be subjected to full load test, or that load which is available at the job site. This testing shall be performed in the presence of the owner. The testing shall be in accordance with NFPA 110, chapter 7.13 requirements.

3. A full tank of fuel shall be provided, replacing any fuel used for testing. The diesel fuel shall be treated with an alcohol-free additive to disperse water and clean injectors.

4. On completion of the installation, start-up shall be performed by a factory-trained dealer service representative. A letter shall be written to the Engineer from the factory-trained dealer, certifying that the system has been installed and field tested to meet the above performance requirements.

5. Three (3) copies of Operating and Maintenance instruction books which shall also include complete parts lists, dimensional drawings, wiring diagrams, schematics and interconnection wiring diagrams, shall be supplied upon delivery of the unit and procedures explained to operating personnel.

6. Prior to final acceptance, the manufacturer shall provide comprehensive training to the owner's designated personnel. Training shall cover, but not be limited to, operation, maintenance and troubleshooting of the equipment.

7. The General Manufacturer shall provide a reactive load bank test (100% load) at the factory prior to shipping the unit, and forward a report to the Engineer.

8. In addition to start-up, the supplier shall temporarily provide a resistor bank for a 4 hour 100% load test, at the installation site.

9. After load bank testing, the manufacturer shall return to the site for 8 hours, to test the generator. Schedule this work through the Engineer's office.

END OF SECTION 26 32 01

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DIVISION 26 32 01.01 – STANDBY DIESEL POWER GENERATOR SET – Alternate #4

GENERAL

1. The Contractor shall furnish a standby power generator set as indicted on the drawings and contained herein. The contractor shall supply all parts for a complete, functioning generator set.
2. All materials, equipment, and parts comprising the units specified herein, shall be new and unused, of current manufacture and of highest grade.
3. The engine, generator and all major items of auxiliary equipment shall be manufactured by manufacturers currently engaged in production of such equipment. The unit shall be furnished by an authorized dealer having a parts and service facility within 150 miles of the project site.
4. The generator set shall be as manufactured by Caterpillar, Cummins, Kohler, or Generac and shall meet the requirements of **UL2200** listing, NFPA 110.

A. PRODUCT

1. Generator Set Characteristics

   a. Acceptable Unit: Kohler 800 REOZMD or approved equivalent.

   b. Rating at 1800 RPM. The rating of the engine-generator system shall be based on operation of the set when equipped with all necessary operating accessories such as radiator fan, air cleaners, etc.

      1) Standby power KW with fan: 810 KW
      2) Standby power KVA with fan: 1013 KVA
      3) Voltage: 277/480, 3 phase, 4W
      4) Power Factor: .8
      5) Frequency: 60 hertz
      6) Amps 1218A

   c. These ratings must be substantiated by manufacturer's standard published curves. Special ratings or maximum ratings are not acceptable.

   d. Set shall be capable of continuous operation for a minimum period of 30 days without damage at the standby rating.

   e. The unit shall be mounted on a structural steel sub-base and shall be provided with spring-type vibration isolators with an operating efficiency of at least 90%.

   f. Safety shut-offs for high water temperature, low oil pressure, overspeed, and engine over-crank shall be provided.

   g. Set shall be capable of continuous operation for a minimum period of 30 days without damage at the standby rating.

2. Engine

   a. Burner Oil: The engine shall be water cooled inline or Vee-type, four cycle compression ignition diesel. It shall meet specifications when operation on No. 2 domestic burner oil (ASTM D396). Diesel engines requiring premium fuels will not be considered. The engine shall be equipped with fuel, lube oil, and intake air filters, lube oil cooler, fuel transfer pump (if needed), fuel priming pump, water pump, secondary fuel filter, water separator, fuel shut-off solenoid, and all piping and appurtenances required for a complete system.

   b. The engine governor shall maintain frequency regulation not to exceed +/- 0.5% from no load to full rated load.

The unit shall be mounted on a structural steel sub-base and shall be provided with spring-

3. Generator

   a. The generator shall be a salient pole brushless, synchronous alternator, continuous rated, .8 4P.F., 1013 KVA, 810 KW. The unit shall be the single bearing type. This assembly shall be compact, sturdy and free from vibration and with a minimum noise level. The generator rotating speed shall not exceed 1800 revolutions per minute.

   b. The generator insulation shall be Class “H” the field shall be equipped with a full amortisseur winding designed for an output of three phase, 60 hertz, 120 volts and shall have an overload capacity of 25% for two (2) hours out of twenty-four (24) hour period.

   c. The generator-exciter-regulator package shall provide a voltage regulation of plus and minus 1% of rated voltage. Voltage regulation shall apply to any load from no load to rated load to rated power factor, and is defined as a change in the output voltage after all transients, due to load change, have decayed to zero.

   d. With the generator operating at rated speed, rated voltage, non-load, the sudden application of rated load, rated power factor shall not cause a transient voltage deviation of more than 15% from rated voltage. Following such a sudden load change, the voltage shall recover to and remain within the regulation band within 1.5 seconds.

   e. Amortisseur windings with the end plates connected between poles shall be included for minimized harmonic content, good transient performance and to provide paralleling capability.

   f. The bearings shall be so located as to enable replacement without disturbing the exciter-rectifier-rotor assembly. The generator shaft shall be sufficiently rigid to avoid torsional vibration. The torsional analysis of the shaft shall be done by the engine supplier.

   g. Voltage regulation shall be accomplished by an automatic volts-per-hertz type, solid state, exciter/regulator shock mounted inside the generator.

   h. The generator shall be capable of sustaining at least 250% of rated current for at least 10 seconds under a three-phase symmetrical short by inherent design or by the addition of an optional current boost system.

   i. A resettable line current sensing circuit breaker with inverse time versus current response shall be furnished which protects the generator from damage due to its own high current capability. This breaker shall not trip within the 10 seconds specified above to allow selective tripping of down-stream fuses or circuit breakers under a fault condition. This breaker shall not automatically reset preventing restoration of voltage if maintenance is being performed. Field current-sensing breaker will not be acceptable.

4. Engine Lubricating System.

   a. The engine shall have a lubricating oil pump for supplying oil under pressure to main bearings, crank pin bearings, pistons, piston pins, timing gears, camshaft bearings, and rocker mechanism. Full flow oil filters, conveniently located for servicing, shall be provided. Lube oil drain extensions and valve terminated on the generator base shall be provided.

5. Cooling System

   a. An engine-mounted radiator with blower type fan shall be sized to maintain safe operation at 110 degrees Fahrenheit maximum ambient temperature. The radiator shall be equipped with a duct adapter flange. Air flow restriction from the radiator shall not exceed 0.5” H_20. The

contractor shall provide ductwork with flexible connecting section between radiator duct flange and discharge louver frame.

b. One or more dry type air cleaners shall be provided as recommended by the manufacturer.

c. Intake louvers shall be sized and located to provide sufficient intake air for engine combustion, ventilating air, and to provide required air flow through the radiator. These louvers shall be by the Electrical Contractor unless noted otherwise.

d. The engine cooling system shall be filled with a solution of 50% ethylene glycol.

6. Fuel System (Sub-Base Tank)

a. The fuel storage tank, gauges and valves shall be provided and installed by the Electrical Contractor in accordance with appropriate codes and regulations.

b. The tank shall meet EPA requirement. Tank pressure test shall meet UL142 requirements.

c. The fuel storage tank shall be a sub-base unit of a all-welded construction double wall tank, heavy gauge steel construction prime coated and finished painted outside with leak sensors between the inner and outer walls of the tank.

d. The tank shall be structurally sound to support the entire generator system.

e. The tank shall have a secondary containment of fuel tank and all other accessories.

f. The tank shall be sized for a continuous 36 hour operation of the generator at full load.

g. All pipe connections shall be threaded.

h. The fuel system shall include the following features:

1) Vent
2) Manual Sight Gauge
3) Lockable Fill Cap
4) Lockable Drain for Inner Tank
5) Lockable Drain for Outer Tank
6) Low Fuel Level Alarm to Sound at the Control Panel Upon 4 Hours of Run Time Remaining
7) Inter-tank Leak Detection Alarm to Sound at Control Panel
8) Fuel line check valve

i. Tank shall be full upon completion of the project.

j. The tank vent shall meet NFPA-37 requirements (12-feet above grade level).

k. Provide overflow spill container.

7. Exhaust System

a. A suitable silencer of the reactive type shall be furnished with the engine. Critical 25-30 DBA reduction.

Provide a critical-grade type silencer including flexible exhaust fitting for remote mounting, properly sized and installed, according to the manufacturer's recommendation. Mounting shall be provided by the installing contractor as shown on the plans and per the manufacturer's standard procedures. Silencer shall be mounted so that its weight is not supported by the engine. Exhaust pipe size shall be sufficient to ensure that measured exhaust back pressure does not exceed the maximum limitations specified by the generator set manufacturer.

b. A stainless steel bellows type exhaust adapter at least 18 inches long shall be furnished for each exhaust outlet to the silencer.

The muffler and all exhaust piping shall be lagged by the installing contractor to maintain a surface temperature not exceed 150 degrees Fahrenheit. The insulation shall be installed so that it does not interfere with the functioning of the flexible exhaust fitting. Insulation outside of the building shall be weatherproof.

8. Automatic Starting System

a. A 12 volt DC electric starting system with positive engagement drive shall be furnished.

b. Fully automatic generator set start/stop controls in the generator control panel shall be provided. Controls shall provide shutdown for low oil pressure, high water temperature, overspeed, overcrank, and one auxiliary contact for activating accessory items. Controls shall include a 30 second single cranking cycle limit with lockout.

c. A unit mounted thermal circulation type water heater shall be furnished to maintain engine jacket water to 90 degrees Fahrenheit in an ambient temperature of 30 degrees Fahrenheit. The heater shall be single phase, 60 hertz, 120 volts. Heater shall be provided with contactor in a rated NEMA enclosure. Heaters shall be disconnected while the engine is running.

9. Batteries

a. The batteries shall be 12 volt maintenance free, lead acid type of suitable capacity to provide 90 seconds of total cranking time at 0 degrees Fahrenheit without recharging and will be rated per manufacturer's recommendation.

b. The battery will be supplied with all necessary intercell and intertray connectors, batter rack, cable, clamps, charged and ready for service.

10. Battery Charger

a. The charger shall be rated at no less than 10 amps and employ transistor controlled magnetic amplifier circuit to provide continuous taper charging.

b. The charger shall maintain rated output voltage with A.C. line fluctuations of +/- 10%.

c. The charger shall contain:

1) Two ranges, float at 1.4 V.P.C. and equalize at 1.6 V.P.C. on maintenance free lead acid batteries.
2) Automatic A.C. line compensation.
3) Automatic overload protection (current limiting).
4) Silicon diode full-wave rectifiers.
5) Automatic surge suppressors.
6) D.C. ammeter and voltmeter.
7) Fused A.C. input and D.C. output.
8) Low D.C. voltage alarm relay.
9) High D.C. voltage alarm relay.

d. A.C. input voltage shall be 120 volt A.C.

11. Generator Control Panel

a. A generator mounted NEMA 1 (or NEMA 12 for outdoor locations) type vibration isolated control panel made from 14 gauge steel shall be provided on the unit, unless otherwise noted. Control panel shall be in accordance with NFPA 110 requirements.

b. Panel shall contain, but not be limited to, the following equipment:

1) Voltmeter, 3 ½", 2% accuracy.
2) Ammeter, 3 ½", 2% accuracy.
3) Ammeter/Voltmeter phase selector switch.
4) Frequency meter, 3 ½", dial type.
5) Automatic starting controls as specified in 7.b.
6) Panel illumination lights and switch.
7) Voltage level adjustment rheostat.
8) Engine oil pressure gauge.
9) Engine water temperature gauge.
10) Dry contacts for remote alarms wired to terminal strips.
11) Fault indicators for low oil pressure, high water temperature, overspeed, overcrank, and not in "auto" position.
12) Four position function switch; "auto", "manual", "off/reset", and "stop".
13) Battery charging ammeter.
14) One set of louver contacts.
15) Tachometer.
16) Running time meter.

12. Main Line Circuit Breaker

a. Three (3) generators mounted Main line molded case circuit breakers with solid state trip units, (125A, 450A, and 1200A) each shall be installed as a load circuit interrupting and protective device. It shall operate both manually for normal switching function and automatically during overload and short circuit conditions. Shunt trip to activate on engine fault condition.

b. The trip unit for each pole shall have elements providing inverse time delay during overload conditions and instantaneous magnetic tripping for short circuit protection. The circuit breaker shall meet standards established by Underwriters' Laboratories, National Electric Manufacturer's Association, and National Electrical Code.

c. Generator exciter field circuit breakers do not meet the above electrical standards and are unacceptable for line protection.

d. Provide ground fault protection per NEC.

e. Generator circuit breakers shall be third party listed.

13. Annunciator Panel

a. A panel shall be provided for remote mounting to give audible and visual warning of fault or alarm conditions in the generator set.

b. The panel shall conform with the requirements of the National Electrical Code.

c. The panel shall be wall mounted. Field coordinate exact location with the Owner.

14. Pre-Alarm Module

a. A generator control panel mounted pre-alarm module shall be provided to meet NFPA 99.

b. It shall provide audible and visual alarm warning of impending fault conditions and provide audible warning on fault shutdown.

15. Sound Attenuated Weatherproof Engine Enclosure

a. Sound Attenuation shall not exceed 77 dBA at 23' from enclosure.

b. Enclosure shall have hinged side doors each side, fixed intake louvers, and metal grille guard on radiator end.

c. Enclosure and all other items to be designed and built by engine manufacturer as an integral part of the entire generator set and be designed to perform without overheating in the ambient temperature specified.

d. Constructed of 14-gauge and 16-gauge sheet metal, suitably reinforced to be vibration free in the operating mode.

e. Four hinged doors provide complete access without their removal.

f. Each door to have at least two latch-bearing points.

g. Side and rear panels to be completely and simply removable to major service access.

h. Locks by padlocks (lock in door handle not suitable).

i. Roof to be peaked to allow drainage of rain water.

j. Baked enamel finish with primer and finish coat to be painted before assembly. All fasteners to be rust resistant.

k. Units shall have sufficient guards to prevent entrance by small animals.

l. Batteries to fit inside enclosure and alongside the engine.

m. Unit shall have coolant and oil drains outside the unit to facilitate maintenance. Each drain line shall have a high quality valve located near the fluid source.

n. Fuel filters must be inside the base perimeter and located so spilled fuel cannot fall on hot parts of the engine or the generator. A cleanable primary fuel strainer shall be used to collect water and sediment between tank and main engine fuel filter.

o. Crankcase fumes disposal shall not terminate in front of the radiator core and reduce cooling capacity.

p. Provide a 6” high concrete pad of sufficient size and structure to support the generator and enclosure.

q. Provide Spill container.

B. EXECUTION

1. The emergency generator, transfer switch(es) and associated equipment shall be warranted by the manufacturer for a period of five (5) years from the date of final inspection and acceptance. The warranty shall be included in the contract documents. The warranty shall include all parts, labor (including travel), expenses and equipment necessary to perform replacement and/or repairs.

2. The generator set shall receive the manufacturer’s standard factory load testing. Prior to acceptance of the installation, equipment shall be tested to show that it is free of any defects and will start automatically and be subjected to full load test, or that load which is available at the job site. This testing shall be performed in the presence of the owner. The testing shall be in accordance with NFPA 110, chapter 7.13 requirements.

3. A full tank of fuel shall be provided, replacing any fuel used for testing. The diesel fuel shall be treated with an alcohol-free additive to disperse water and clean injectors.

4. On completion of the installation, start-up shall be performed by a factory-trained dealer service representative. A letter shall be written to the Engineer from the factory-trained dealer, certifying that the system has been installed and field tested to meet the above performance requirements.

5. Three (3) copies of Operating and Maintenance instruction books which shall also include complete parts lists, dimensional drawings, wiring diagrams, schematics and interconnection wiring diagrams, shall be supplied upon delivery of the unit and procedures explained to operating personnel.

6. Prior to final acceptance, the manufacturer shall provide comprehensive training to the owner's designated personnel. Training shall cover, but not be limited to, operation, maintenance and troubleshooting of the equipment.

7. The General Manufacturer shall provide a reactive load bank test (100% load) at the factory prior to shipping the unit and forward a report to the Engineer.

8. In addition to start-up, the supplier shall temporarily provide a resistor bank for a 4 hour 100% load test, at the installation site.

9. After load bank testing, the manufacturer shall return to the site for 8 hours, to test the generator. Schedule this work through the Engineer's office.

END OF SECTION 26 32 01

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DIVISION 26 36 01.01 – AUTOMATIC TRANSFER SWITCH – BASE BID

A. GENERAL

1. The Contractor shall furnish an automatic transfer switch as shown on the drawings and as specified herein.

2. When an emergency generator system or prime power system is furnished as part of the work, the subcontractor furnishing the generator equipment shall furnish the automatic transfer switch.

3. Transfer switch(es) shall be as manufactured by Kohler, or approved equivalent by Cummins, Generac, or Caterpillar.

4. The automatic transfer switch shall be contactor type (full size neutral contactor), with arc suppression chutes.

5. The automatic transfer switch shall conform to UL-1008 and NEC-700.

B. PRODUCT

1. The two (2) transfer switches shall be 277/480 volt rated, UL service entrance (ULSE) sized (125 amps and 400 amps), three (3) phase, four (4) wire, four (4) pole with overlapping neutral and with adjustable time-delayed neutral transfer. The transfer switch(es) shall be capable of switching all classes of load and shall be rated for continuous duty when installed in a NEMA 1 enclosure (see plans) in accordance with Underwriters' Laboratories, Inc. Standard UL-1008, The transfer switches shall be ULSE.

2. The automatic transfer switch shall be rated to withstand the RMS symmetrical short circuit current available at the automatic transfer switch terminals with the type of overcurrent protection and voltage as shown on the plans.

3. The transfer switch(es) shall be equipped with a manual operator that is designed to prevent injury to the operating personnel if the electrical operator should suddenly become energized during manual transfer. The manual operator shall provide the same contact-to-contact transfer speed as the electrical operator to prevent a flashover from switching the main contacts slowly.

4. The automatic transfer switch shall have a test switch or push button to simulate power failure.

5. Generator exercising time switch with load/no load selector switch shall be included.

6. The transfer switch shall be rigidly constructed to close into and withstand the bolted fault current available at the switch.

    a. All transfer switch coils, springs, control elements shall be easily inspectable and conveniently removable from the front of the transfer switch without major disassembly or disconnection of power conductors.

    b. All feeder lugs, relays, timers, control wiring and accessories shall be front accessible.

    c. The control module and transfer switch shall be physically separated.

    d. Main contacts shall be silver alloy composition.

7. The transfer switch shall be provided with light-emitting diodes (LED) as follows:

    a. Contactor Position: normal (utility) and emergency (generator)
    b. Plant Excercisor active
    c. In Phase Monitor active

d. A test button shall light all light emitting diodes (LEDs)

8. Auxiliary contacts shall be provided as follows:

   a. Contactor in normal position – 3 sets
   b. Contactor in emergency position – 3 sets

9. Three phase transfer switches shall be 3-pole with overlapping neutral transfer contacts, or 4-pole with neutral contacts of same capacity as phase contacts.

10. Transfer switch control system

    a. The control module shall direct the operation of the transfer switch. The modules sensing and lock shall be micro-processor based. The control settings shall be stored in non-volatile memory.

    b. The control module shall have a three position, key-operated programming control switch. The key shall be removable in any position. The positions shall be:

       - Off – allows all enabled accessories to be monitored only. Settings cannot be changed while in this position.
       - Local – allows all enabled accessory settings to be changed locally at the transfer switch control panel.
       - Remote – allows all enabled accessories to be altered via the remote communications port.

11. The normal and emergency contacts shall be positively interlocked mechanically and electrically to prevent simultaneous closing. The main contacts shall be mechanically locked into position for both the normal and emergency positions without the use of hooks, latches, magnets or springs.

12. The switches shall include voltage and frequency sensing of the emergency source and shall be factory set to allow transfer to emergency when that source is at approximately rated voltage and frequency.

13. The transfer time shall not exceed one-sixth (1/6) second.

14. In-phase monitoring shall be provided to continuously monitor the contactor transfer times, source voltage, frequency and phase angle to provide a self-adjusting, zero crossing contactor transfer signal.

15. Anti-single phasing protection shall be provided to detect regenerative voltage as a failed source condition.

16. Approval Required

    a. As a precondition for approval, the transfer switch(es), complete with timers, relays and accessories shall be listed by Underwriters' Laboratory, Inc. in their Electrical Construction Materials Catalogue under Standard UL-1008 (automatic transfer switches) and approved for use on Emergency Systems.

    b. On request, the manufacturer shall provide a letter certifying compliance with all requirements of the transfer switch specifications. The certification shall identify equipment by serial number and shall include no exceptions to the specifications not stipulated with the submittal.

17. The automatic transfer switch shall also be equipped with an exerciser to start the generator and transfer the load for a period of thirty minutes once a week. After thirty minutes, the transfer switch shall switch back to the utility power source.

C. EXECUTION

1. Sequence of Operation

   a. Source drops below a range of 70-95% of rated voltage (factory set at 85%) after an adjustable time delay period of .05 to 6 seconds (factory set at 3 seconds) to allow for momentary dips. The transfer switch shall transfer to emergency as soon as the generator voltage has reached a range of 75-100% of rated voltage (factory set at 90%) and generator rated frequency of 85-100% (Factory set at 90%).

      - After restoration of normal power on all phases to 80% of rated voltage, an adjustable time delay period of 0-30 minutes (factory set at 5 minutes) shall delay re-transfer to normal power until it has stabilized. If the emergency power source should fail during the time delay period, the time delay shall be by-passed and the switch shall return, immediately, to the normal source.

      - After the switch has transferred to normal, the engine generator shall be allowed to operate at no load for 5 minutes to allow it to cool before shutdown. The engine cool-down timer may be installed in the generator control panel.

2. Submittal, Operator's Manual and Warranty

   a. Submittal shall include specification sheets showing all standard and optional accessories to be supplied; schematic wiring diagrams; dimension drawings; and interconnection diagrams identifying by terminal number each required interconnection between the generator set, the transfer switch, and the remote annunciator panel if it is included elsewhere in these specifications.

   b. Each transfer switch shall be provided with an operator's manual providing installation and operating instructions.

   c. The automatic transfer switch and generator set shall be warranted by the generator set manufacturer for a period of five (5) years from the date of final inspection and acceptance. The warranty shall cover all parts and labor (including travel), expenses and equipment necessary to perform replacement and/or repairs.

3. A letter of certification from a factory representative shall be furnished to the Engineer stating that the automatic transfer switch(es) has been installed in accordance with the manufacturer's instructions, and that the switch has been tested for compliance with the above performance requirements.

END OF SECTION 26 36 01

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DIVISION 26 36 01.02 – AUTOMATIC TRANSFER SWITCH – ALTERNATE #4

A. GENERAL

1. The Contractor shall furnish an automatic transfer switch as shown on the drawings and as specified herein.

2. When an emergency generator system or prime power system is furnished as part of the work, the subcontractor furnishing the generator equipment shall furnish the automatic transfer switch.

3. Transfer switch(es) shall be as manufactured by Kohler, or approved equivalent by Cummins, Generac, or Caterpillar.

4. The automatic transfer switch shall be contactor type (full size neutral contactor), with arc suppression chutes.

5. The automatic transfer switch shall conform to UL-1008 and NEC-700.

B. PRODUCT

1. The three (3) transfer switches shall be 277/480 volt rated, UL Service entrance rated (ULSE) sized (125 amps, 600 amps and 1000 amps), three (3) phase, four (4) wire, four (4) pole with overlapping neutral and with adjustable time-delayed neutral transfer. The transfer switch(es) shall be capable of switching all classes of load and shall be rated for continuous duty when installed in a NEMA 1 enclosure (see plans) in accordance with Underwriters' Laboratories, Inc. Standard UL-1008.

2. The automatic transfer switch shall be rated to withstand the RMS symmetrical short circuit current available at the automatic transfer switch terminals with the type of overcurrent protection and voltage as shown on the plans.

3. The transfer switch(es) shall be equipped with a manual operator that is designed to prevent injury to the operating personnel if the electrical operator should suddenly become energized during manual transfer. The manual operator shall provide the same contact-to-contact transfer speed as the electrical operator to prevent a flashover from switching the main contacts slowly.

4. The automatic transfer switch shall have a test switch or push button to simulate power failure.

5. Generator exercising time switch with load/no load selector switch shall be included.

6. The transfer switch shall be rigidly constructed to close into and withstand the bolted fault current available at the switch.

    a. All transfer switch coils, springs, control elements shall be easily inspectable and conveniently removable from the front of the transfer switch without major disassembly or disconnection of power conductors.

    b. All feeder lugs, relays, timers, control wiring and accessories shall be front accessible.

    c. The control module and transfer switch shall be physically separated.

    d. Main contacts shall be silver alloy composition.

7. The transfer switch shall be provided with light-emitting diodes (LED) as follows:

    a. Contactor Position: normal (utility) and emergency (generator)
    b. Plant Excercisor active

c. In Phase Monitor active
d. A test button shall light all light emitting diodes (LEDs)

8. Auxiliary contacts shall be provided as follows:

   a. Contactor in normal position – 3 sets
   b. Contactor in emergency position – 3 sets

9. Three phase transfer switches shall be 3-pole with overlapping neutral transfer contacts, or 4-pole with neutral contacts of same capacity as phase contacts.

10. Transfer switch control system

    a. The control module shall direct the operation of the transfer switch. The modules sensing and lock shall be micro-processor based. The control settings shall be stored in non-volatile memory.

    b. The control module shall have a three position, key-operated programming control switch. The key shall be removable in any position. The positions shall be:

       - Off – allows all enabled accessories to be monitored only. Settings cannot be changed while in this position.
       - Local – allows all enabled accessory settings to be changed locally at the transfer switch control panel.
       - Remote – allows all enabled accessories to be altered via the remote communications port.

11. The normal and emergency contacts shall be positively interlocked mechanically and electrically to prevent simultaneous closing. The main contacts shall be mechanically locked into position for both the normal and emergency positions without the use of hooks, latches, magnets or springs.

12. The switches shall include voltage and frequency sensing of the emergency source and shall be factory set to allow transfer to emergency when that source is at approximately rated voltage and frequency.

13. The transfer time shall not exceed one-sixth (1/6) second.

14. In-phase monitoring shall be provided to continuously monitor the contactor transfer times, source voltage, frequency and phase angle to provide a self-adjusting, zero crossing contactor transfer signal.

15. Anti-single phasing protection shall be provided to detect regenerative voltage as a failed source condition.

16. Approval Required

    a. As a precondition for approval, the transfer switch(es), complete with timers, relays and accessories shall be listed by Underwriters' Laboratory, Inc. in their Electrical Construction Materials Catalogue under Standard UL-1008 (automatic transfer switches) and approved for use on Emergency Systems.

    b. On request, the manufacturer shall provide a letter certifying compliance with all requirements of the transfer switch specifications. The certification shall identify equipment by serial number and shall include no exceptions to the specifications not stipulated with the submittal.

17. The automatic transfer switch shall also be equipped with an exerciser to start the generator and transfer the load for a period of thirty minutes once a week. After thirty minutes, the transfer switch shall switch back to the utility power source.

C. EXECUTION

1. Sequence of Operation

   a. Source drops below a range of 70-95% of rated voltage (factory set at 85%) after an adjustable time delay period of .05 to 6 seconds (factory set at 3 seconds) to allow for momentary dips. The transfer switch shall transfer to emergency as soon as the generator voltage has reached a range of 75-100% of rated voltage (factory set at 90%) and generator rated frequency of 85-100% (Factory set at 90%).

      - After restoration of normal power on all phases to 80% of rated voltage, an adjustable time delay period of 0-30 minutes (factory set at 5 minutes) shall delay re-transfer to normal power until it has stabilized. If the emergency power source should fail during the time delay period, the time delay shall be by-passed and the switch shall return, immediately, to the normal source.

      - After the switch has transferred to normal, the engine generator shall be allowed to operate at no load for 5 minutes to allow it to cool before shutdown. The engine cool-down timer may be installed in the generator control panel.

2. Submittal, Operator's Manual and Warranty

   a. Submittal shall include specification sheets showing all standard and optional accessories to be supplied; schematic wiring diagrams; dimension drawings; and interconnection diagrams identifying by terminal number each required interconnection between the generator set, the transfer switch, and the remote annunciator panel if it is included elsewhere in these specifications.

   b. Each transfer switch shall be provided with an operator's manual providing installation and operating instructions.

   c. The automatic transfer switch and generator set shall be warranted by the generator set manufacturer for a period of five (5) years from the date of final inspection and acceptance. The warranty shall cover all parts and labor (including travel), expenses and equipment necessary to perform replacement and/or repairs.

3. A letter of certification from a factory representative shall be furnished to the Engineer stating that the automatic transfer switch(es) has been installed in accordance with the manufacturer's instructions, and that the switch has been tested for compliance with the above performance requirements.

END OF SECTION 26 36 01

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SECTION 26 43 13 – TRANSIENT VOLTAGE SURGE SUPPRESSOR

A. GENERAL

1. Scope

   a. This section includes Surge Protective Devices (SPDs) for low-voltage power equipment (1000Vac and less).

   b. Work under this section consists of furnishing all materials necessary for the execution and complete installation of Surge Protective Devices (SPDs).

2. Related Work/Sections

   a. In addition to this section, the Contractor shall refer to other specification sections and drawings to ascertain the extent of work included.

   b. Existing Utilities: Do not interrupt utilities serving facilities occupied by the Owner or others except when permitted and then only after arranging to provide temporary utility services according to requirements indicated. Notify and coordinate with the engineer when an interrupt is required and prior to interrupting.

3. Quality Assurance/Reference Standards

   The SPD Surge protection system shall be designed and manufactured, and where appropriate, listed to the following standards.

   a. Underwriters Laboratory (UL)

      1) UL1449 4th Edition: Surge Protective Devices (SPD)
      2) UL1283 5th Edition: Electromagnetic Interference Filters
      3) cUL – UL: Evaluation to Canadian Safety Requirements (UL 1449, 1283)

   b. Institute of Electrical & Electronic Engineers (IEEE)

      1) C62.41.1: 2002 IEEE Guide on the Surge Environment in Low-Voltage (1000V and less) AC Power Circuits.

      2) C62.41.2: 2002 IEEE Recommended Practice on Characterization of Surges in Low-voltage (1000V and less) AC Power Circuits.

      3) C62.45: 2002 IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000V and less) AC Power Circuits.

      4) C62.62: 2000 IEEE Standard Test Specifications for Surge Protective Devices for Low Voltage (1000V and less) AC Power Circuits.

      5) C62.72: 2007 IEEE Guide for the Application of Surge Protective Devices for Low Voltage (1000V and less) AC Power Circuits.

   c. National Electrical Manufacturers Association (NEMA)

   d. National Fire Protection Association, NFPA 70, National Electric Code, 2017 (NEC)

   e. Federal Information Processing Standards Publication 94 (FIPS 94), 1983 Guideline on Electrical Power for ADP Installations.

f. MIL-STD 220A

4. Project Conditions

a. Service Conditions: The Surge Protective Device (SPD) shall be rated for continuous operation under the following conditions:

1) Maximum Continuous Operating Voltage (MCOV): 115% to 125% of the nominal operating voltage

2) Operating Temperature: -40°C to 60°C

3) Relative Humidity: 0% to 95%, non-condensing

4) Operating Altitude: 0 feet to 12,000 feet

5. Submittals

a. Alternate manufacturers shall submit specification compliance report and drawings ten (10) days prior to bid for consideration.

b. The specific item proposed and its area of application shall be indicated on the product specification sheet.

c. Submit certified test results for all models as follows:

UL listing verification:

1) Submit UL1449 4th Edition Voltage Protection Ratings “VPR”.

2) Submit proof that products are UL *listed and labeled by Underwriters Laboratories* to UL 1449 4th Edition.

d. Provide warranty statement.

6. Locations

a. See the electrical power riser diagram and electrical plan drawings for Surge Protective Device (SPD) unit locations.

B. PRODUCTS

1. General

a. The following are the general requirements of the SPD products:

1) Nomenclatures used herein are intended to indicate product type and configuration of equipment required.

2) UL 1449 4th Edition Listed, bearing the official UL 4th Edition gold hologram label.

3) UL 1283 5th Edition Listed.

4) The Surge Protective Device (SPD) shall be a standalone configuration. System s that must be integral to the switchgear will not be considered.

5) All SPD systems shall be permanently connected, parallel designs. Series suppression elements shall not be acceptable.

6) The SPD shall be marked with a Short Circuit Current Rating (SCCR) and shall not be installed at a point on the system where the available fault current is in excess of that rating per the National Electric Code, Article 285, Section 6.

7) All SPD units shall be from the same manufacturer.

8) SPD designs using a single fuse to protect two (2) or more surge paths shall not be acceptable.

9) SPD designs that limit the 100% rated surge protections shall not be acceptable.

10) Fuse links or printed circuit board trace fusing shall not be acceptable.

11) Hybrid design utilizing:

a) Thermally Protected Metal Oxide Varistors

b) Filter capacitors to suppress EMI/RFI electrical noise.

2. Modular Surge Protection for Service Entrance/Main Distribution Applications **"MDP"**

a. Configured for the voltage as shown on the riser diagram and/or panel schedules.

b. The SPD surge current ratings shall be based on the electrical system ampacity listed in the table below:

Electrical System Ampacity @ SPD Install Point	**Surge Protection (kA)**	
	Per Mode	**Per Phase**
2500 - 6000A	300	600
1200 - 2000A	250	500
600 - 1000A	200	400
225 - 400A	150	300
125 - 225A	100	200

c. The SPD shall be rated for 480/277Vac 3 Phase, 4 Wire + Ground, Wye.

d. Modes of Protection: The SPD system shall provide surge protection in all possible modes (L-N, L-G, L-L, and N-G). Each replaceable module shall provide the uncompromising ability to deliver full surge current rating per mode.

e. SPD modules shall be configured to isolate individual suppression component failures without causing total loss of surge protection in that mode.

f. Opening of supplementary protective devices, internal or external, shall not be permissible during UL 1449 4th Edition Nominal Discharge testing.

g. Optional Connection Methods: Terminal Block, 60A #6AWG Wire.

h. Each individual module shall feature a green LED indicating the individual module has all surge protection devices active. If any module is taken off-line, the green LED will turn off and a red LED will illuminate, providing *individual module* as well as *total system* status indication.

i. The SPD shall include Solid State Status Indication Lights, Form C Contact, and Audible Alarm & Surge Counter.

j. The modular SPD shall be provided in a NEMA 1 enclosure.

k. The SPD shall provide EMI/RFI electrical noise attenuation up to 43dB in the range of 50kHz to 100MHz as defined by MIL-STD-220A test procedures.

l. Voltage Protection Ratings: The UL 1449 4th Edition Voltage Protection Ratings "VPR" (6kV, 3000 Amps, 8/20µs waveform) shall not exceed the UL assigned values listed below:

Voltage Protection Ratings (VPR) 6kV, 3000A, 8/20µs Waveform	Voltage Rating	
	208/120V	480/277V
Line to Neutral	900V	1200V
Line to Ground	800V	1200V
Neutral to Ground	700V	1200V
Line to Line	1200V	2000V

m. The SPD shall have a minimum UL 1449 4th Edition Nominal Discharge Current Rating (I_n) of 10,000 Amps. When used in conjunction with a UL 96A certified Lightning Protection System the (I_n) rating shall be 20,000 Amps.

n. Approved Manufacturers: The following SPD manufacturers and respective models shall be deemed acceptable, subject to conformance with indicated requirements:

THOR SYSTEMS
Current Technologies
Liebert

3. Non-Modular Surge Protection for Distribution, Sub-Distribution and Branch Circuit Panels (Lower Ampacity, 15A to 800A, Applications)

a. Configured as shown on the riser diagram and/or panel schedules.

b. The SPD surge current ratings shall be based on the electrical system ampacity listed in the table below:

Electrical System Ampacity @ SPD Install Point	Surge Protection (kA)	
	Per Mode	Per Phase
400 - 800A	150	300
125 - 225A	100	200
15 - 100A	50	100

c. The SPD shall be rated for 208/120Vac 3 Phase, 4 Wire + Ground, Wye.

d. Modes of Protection: The SPD system shall provide surge protection in all possible modes (L-N, L-G, L-L, and N-G). Each device shall provide the uncompromising ability to deliver full surge current rating per mode.

e. All non-modular units shall be factory wired using color coded #10AWG Rope Lay Wire (with 413 strands/36AWG, seven [7] groups of 59 strands each): two feet (2') for each phase conductor and three feet (3') for Neutral and Ground conductors.

f. The SPD shall include Solid State Status Indication Lights, Form C Contact, Audible Alarm & Surge Counter.

g. The non-modular SPD shall be provided in a compact NEMA 1 polycarbonate enclosure with a CLEAR cover.

h. The SPD shall provide EMI/RFI electrical noise attenuation up to 43dB in the range of 50kHz to 100MHz as defined by MIL-STD-220A test procedures.

i. Voltage Protection Ratings: The UL 1449 4th Edition Voltage Protection Ratings "VPR" (6kV, 3000 Amps, 8/20µs waveform) shall not exceed the UL assigned values listed below:

Voltage Protection Ratings (VPR) 6kV, 3000A, 8/20µs Waveform	**Voltage Rating**	
	208/120V	**480/277V**
Line to Neutral	700V	1200V
Line to Ground	700V	1200V
Neutral to Ground	800V	1200V
Line to Line	1000V	2000V

j. The SPD shall have a minimum UL 1449 4th Edition Nominal Discharge Current Rating (I_n) of 10,000 Amps. When used in conjunction with a UL 96A certified Lightning Protection System the (I_n) rating shall be 20,000 Amps.

k. Approved Manufacturers: The following manufacturers shall be deemed acceptable, subject to conformance with indicated requirements:

THOR SYSTEMS
Current Technologies
Liebert

4. Warranty

a. All Surge Protective Devices (SPDs), associated hardware, and supporting components shall be warranted to be free from defects in materials and workmanship, under normal use and in accordance with the instructions provided, for a period of five (5) years.

b. A detailed warranty statement shall be provided with each unit.

C. EXECUTION

1. This section covers the execution and commissioning of the Surge Protective Device (SPD) required on this project.

2. Technical assistance shall be provided by the manufacturer through the efforts of a factory representative or a local distributor.

3. Verify absence of damage.

4. The unit shall be installed in accordance with the manufacturer's printed instructions. All local and national codes shall be observed.

5. The unit shall be installed of the same voltage rating as the intended protected equipment.

6. The unit shall be installed on the load side of the service equipment overcurrent device.

7. The location of the field-mounted SPD shall allow adequate clearances for maintenance.

8. Lead Length: The mounting of the SPD shall ensure the connecting leads are as short (recommend one [1] meter or less) and straight (no sharp bends) as reasonably possible.

9. Before energizing the SPD, the unit shall be verified as to: correct as specified: manufacturer, product series, and model number.

10. All voltage modes including L-L (Line-to-Line), L-G (Line-to-Ground), L-N (Line-to-Neutral), and N-g (Neutral-to-Ground) shall be measured and verified against the unit voltage ratings.

11. Continuity measurements shall be made between the Neutral and Ground connections to verify the Neutral-to-Ground bond.

END OF SECTION 26 43 13

SECTION 26 51 00 – LIGHTING FIXTURESGENERAL

A. GENERAL

1. The Contractor shall provide all fixtures and lamps where indicated on the Drawings.

2. Work shall include all stems, canopies and accessories necessary for a complete lighting fixture installation.

3. For all integrally manufactured LED lighting provide a minimum of 10 year warranty. For all modular manufactured products (separate fixture and driver) provide a minimum of 10 year warranty for LEDs and five year warranty for driver.

B. PRODUCT

1) Fixtures shall be as specified in the Fixture Schedule on the Drawings or approved equivalents.

2) All outdoor fixtures shall be listed and labelled for damp or wet locations as applicable.

3) Unless otherwise noted, all fixtures shall be new, free of defects and imperfections.

4) All acrylic lenses for lay-in troffers and wrap around fixtures shall have an average lens thickness of .125".

5) All lighting fixtures shall be as specified on the plans or an approved equivalent.

6) Whenever a mechanically held lighting contactor is specified, it shall be provided with a 2 wire interface module to assist in unlatching the contactor upon removal of AC power.

7) "Bat-wing" supports shall be used to support all flexible metal cabling fixture whips from off of the ceiling. The clip shall be affixed to the support wires supporting the ceiling and lights.

8) Where vandal proof or tamper proof fixtures are specified, tamper proof screwdrivers shall also be provided. The quantity of screwdrivers provided shall be equal to 10% of the number of vandal proof fixtures, or two (2), whichever is greater.

9) LED Lighting

a) All LED drivers shall comply with NEMA 410-2011 for standard inrush current.

b) Drivers for LED fixtures shall have a power factor greater than 90% and less than 20%

c) Provide a minimum of 2.5 KV surge suppression integral with driver for all indoor fixtures.

d) All fixtures shall be listed in one of the following locations: LED lighting facts website (www.lightingfacts.com), Energy Star website (www.energystar.gov), or the Design Light Consortium website (www.designlights.org).

e) For integrally manufactured products provide a minimum of 10 year warranty.

f) For all integrally manufactured LED lighting provide a minimum of 10 year warranty. For all modular manufactured products (separate fixture and driver) provide a minimum of 10 year warranty for LEDs and five year warranty for driver.

g) LED lighting circuits shall not be loaded more than 60%.

h) Contractor shall evaluate branch circuit length and increase size as described elsewhere in the contract documents. At no point shall the voltage drop to LED lighting exceed 3%.

i) Refer to the SSL Lighting guidelines on the SCO website for additional requirements.

C. EXECUTION

1. All ceiling mounted fixtures (other than the lay-in type) less than 20 pounds shall be individually supported from building structure with 1/4" threaded rods and nuts. See structural plans for fixture supporting methods for fixtures over 20 pounds.

2. Lay-in fixtures shall be supported from the structure by a minimum of four steel support wires, attached to each corner of the light fixture and building structure. The fixture shall be screwed to the main runners of the lay-in ceiling track at each of the four (4) corners of the fixture. The ceiling suspension system shall not be used to support the light fixture.

3. The complete emergency lighting system shall be tested by removing power to all emergency lights. Battery voltage shall be recorded at the start of the test. 90 minutes thereafter, the battery voltages shall be recorded. These results shall be included in a report to be submitted to the Engineer. This test shall be performed just prior to final inspection and in accordance with National Electrical Code Articles 700-4 (a) and (d).

END OF SECTION 26 51 00

SECTION 26 77 62 – MULTI-PURPOSE/DINING ROOM/PLATFORM SOUND SYSTEM

A. GENERAL –

This system shall be provided under an Allowance. Refer to Architect's Allowance Section 01 21 00. **All conduit, outlet boxes and power shall be provided by the electrical contractor as part of the base bid.**

1. The sound system shall provide for the pick-up, processing, amplification and distribution of live and prerecorded program material. Sound coverage of the audience area shall be by main speakers. One on each outside stage perimeter as well as fill in speakers beyond where the curtain can be drawn to separate the room.

2. An Assisted Listening System shall be provided to comply with NCBS Volume 1C Handicap Accessibility Requirements.

3. The system shall consist of both wireless and wired microphones. Also, included there shall be two mixers, cd/cd writer, digital processors, equipment storage drawer, amplifiers, speakers, wall jacks, lock-able wall rack with required spacing for equipment supplied, power conditioner, vented blanks, mic cables and all other cabling. All miscellaneous items shall be included for a complete operational system. All components shall be new and of the latest design. All items shall be professional grade. All equipment to be housed in one rack. Each piece of rack mounted equipment shall be separated by a 1.75" vented blank.

4. The specifications call for specific products (basis of design) to establish quality and performance criteria for this project. Other equipment will be considered that meet the criteria. Submit detailed cut sheets 10 days prior to bid date. Approval must be given before submissions will be allowed. Along with other submittal requirements the contractor must provide a list of at least 5 projects of similar design.

B. PRODUCTS

1. **Mixer** – The basis of design for MIXER is BOGEN VMIX, with 8 module bays capable of accepting advanced plug-in modules, with 2 bays capable of accepting signal-processing plug-in output modules. Each channel shall have its own independent volume control, and LED signal/clip indicator. The mixer shall have a master volume control, bass and treble controls, an 11-segment LED output level switch (-50, -10, and +4dBu), circuit breaker with reset capability, one power indicator, a grounded un-switched AC convenience receptacle with a 500W maximum capacity provided for external equipment. The mixer shall be capable of being bridged and muted. The mixer shall be rack mountable (with RPK87 rack mount kit). The mixer shall come with a 3 year parts warranty, (2RU each). Approved manufacturers: Bogen, Mackle, Allen Heath.

   QUANTITY - TWO

2. **CD/CD Recorder** – The basis of design for CD/CD Writer is Tascam model CDRW750. Approved manufacturers: Denon, TDK, Tascam. Features required are:

   - Uses professional grade and consumer grade CDs
   - CD-text reading and writing capability
   - Unbalanced RCA Analog I/O
   - SPDIF coax and optical digital I/O
   - Wireless remote
   - Repeat play
   - Digital gain adjustment
   - Head phone output

QUANTITY - ONE

3. **Equalizer** – The basis of design for Digital Equalizer is SHURE DFR22. Approved manufacturers: Shure, Peavey, Ashly Protea. The device shall have 2 analog inputs and 2 analog outputs. Phoenix (Euroblock) and XLR connectors shall be available on the back panel for each input and output. The inputs shall accept line level signals up to at least +24dBu. The outputs shall have a clipping level to +24dBu and shall provide analog pads for lowering the output clipping level to +12dBu and 6dBu. The frequency response of the device shall deviate no more than 1 dB from 20 Hz to 20 kHz. Analog to digital conversion and digital to analog conversion shall be performed at a resolution of 24-bit with a 48 kHz sampling rate. The overall dynamic range of the device from input to output shall be >110 dBa from 20Hz to 20Khz. The device shall have an internal auto-switching power supply capable of accepting an operating voltage from 100-240 VAC, 50/60 Hz. The unit shall be programmable. The front panel shall display an LED for each feedback filter. (1RU)

   QUANTITY – ONE

4. **Assistive Listening System** – Basis of design for Assistive Listening System is Drake ALT-1000 – Receivers DRAKE MR306. Approved manufacturers: Drake, Williams Sound, Phonic Ear. The transmitter shall operate in the 72-76 MHz Auditory Assistance Band as approved by the FCC. The operating frequency and mode: “Stereo” or “Mono” shall be shown on an LCD display and be programmable by the front panel “up” and “down” buttons. The transmitter shall be FCC approved. The transmitter shall permit fitting of a 7” flexible antenna mounted through the top cover of the rack unit. The transmitter shall have XLR connections for balanced audio inputs and RCA Phono connectors for unbalanced audio inputs. There shall be a front panel control to adjust the audio input level with an LED (OVER) MODULATION indicator. There shall be a ¼” stereo monitor jack with volume control. The transmitter shall be powered by an external AC line to 12 VDC power adapter. The transmitter shall be rack mountable. Provide number of receivers requested. (1RU)

   Occupancy capacity (951). (1) Transmitter, 35 Receivers (9 shall be hearing aid compatible)

5. **Wireless MIC Systems** – Basis of Design for WIRELESS SYSTEMS is SHURE SLX 24s with SM-58 handhelds and WL 185 lapels. Approved manufacturers: Shure, Telex, Lectrosonics. The wireless system shall operate in the UHF band between 698 MHz and 865 MHz, with the specific available frequency range being dependent on the user’s location. Effective range of the system shall be 300ft under optimal conditions. Each system shall allow selection of over 960 operating frequencies across 24 MHz of bandwidth in order to avoid RF interface. The process of synchronization shall be simple and instantaneous. Each transmitter shall be powered by two AA batteries. Transmitters shall have a power on-off/mute switch, as well as a timed, backlit LCD showing frequency group and channel, locked/unlocked status, and battery strength. The receiver shall have a multi-function display showing group, channel, frequency, transmitter battery, and locked/unlocked status. The system shall use diversity technology to improve reception, minimize signal dropouts, and achieve the best possible signal-to-noise ratio. The receiver shall include an audio level meter and an infrared port for system synchronization. (1RU)

   QUANTITY – SLX 24 RECEIVERS – 4 SM-58 TRANSMITTERS – 2 WL185 LAPELS – 2

6. **Antenna Combiner** – Basis of Design for ANTENNA COMBINER is SHURE MODEL UA844US. Approved manufacturers: Shure, Telex, Sennheiser. The SHURE MODEL UA844US shall be a wide band four-way active antenna splitter and power distribution system with external power supply. The antenna system shall have the capability to be rack mounted.

   QUANTITY – ONE

7. BASIS of Design for OVERHEAD CLUSTER SPEAKERS is APOGEE AFI4s. Approved manufacturers: Apogee, Electro-voice, Community. The speakers shall have a 12” permanent magnet cone type driver treated with waterproofing compound that provides resistance to moisture

enabling long-term stability of cone resonance and cone mass parameters. Driver also treated with Ferrofluid for greater power handling capability, low distortion, and control of short term impedance rise. Voice coil shall measure 1.75" and also be treated with Ferrofluid. There shall be two handles: one on top and one on the bottom. These handles shall not contain any moving parts. Speaker grills shall be constructed of perforated steel. Plastic or polymer grilles will not be accepted. Cabinet construction shall be made of multi-ply hardwood. Each speaker shall have a maximum continuous rating of 200 watts at 8 ohms. All necessary mounting hardware to be included. Main speakers to be connected to CH 1 on main amp.

QUANTITY - TWO

8. **Fill-In Speakers** - Basis of Design for FILL-IN SPEAKERS is Bogen OCS1 (recessed) (70 Volt). Approved manufacturers: Bogen, JBL, Electro-Voice. The FILL-IN SPEAKERS shall be of surface design, consisting of a 6.5" low frequency transducer, a coaxsually-mounted ¾" high frequency transducer and frequency dividing network installed in a ported enclosure. The low frequency voice coil shall be 1" in diameter and the coil former shall be of aluminum for maximum heat dissipation. Rated power shall be at least 75 watts continuous pink noise power. The high frequency transducer shall be horn –loaded to more evenly cover a minimum110 degree polar are conical area. The backcan shall be constructed of formed steel and the baffle of UL94V-0 fire rated medium impact polystyrene. An enclosed terminal box shall be included proving strain relief for use with either plenum=rated wire, ½" conduit or flexible conduit up to 7/8" outside diameter. The external wiring shall be accomplished via a removable lockable wiring connector with screw-down terminals to provide both secure wire terminations and prewiring capability before loudspeaker installation. An attachment loop shall be provided on the back panel for cabling to building structure as a secondary point of support. The system shall include a support backing plate to reinforce the ceiling material and tile support rails for use with standard ceiling tiles. The speakers shall have a 70.7 volt transformer with selectable taps

   QUANTITY - TWELVE

9. **Monitor Speaker** – Basis of Design for MONITOR SPEAKER is APOGEE AFI – Point 5. Approved manufacturers: Apogee, Electro-Voice, Community. The monitor speaker shall have one low frequency 5.25" permanent magnet cone type driver and one .5" Mylar tweeter. Connectors shall be of the spring type. The grill shall have a highly durable, quality finish on perforated steel. Nominal impedance shall be 8 ohms with maximum power handling of 60W continuous/240W peak. Speaker shall be hung on inside of proscenium wall facing the stage. Speaker shall be connected to CH. 2 of the main amplifier. Music source only for input to this channel.

   QUANTITY – ONE

10. **Main Amplifier** – Basis of Design for MAIN AMPLIFIER is APOGEE CA-2000. The MAIN AMPLIFIER shall contain the latest in power MOSFET technology. Approved manufacturers: Apogee, Crest-Audio, Crown. All controls shall be located on the rear of the unit to avoid being tampered with. The air intake and air filter shall be located on the front panel for easy access when cleaning is required. The front end circuitry shall feature an advanced clip eliminator to reduce distortion. Speaker protection shall be provided by means of an ultra-fast crowbar unit. The amplifier shall be equipped with adjustable speed fans for quiet, efficient cooling and feature internally configurable AC mains for 120 VAC or 230 VAC. The MAIN AMPLIFIER shall have a rating of 180 watts at 8 ohms. (2RU)

    QUANTITY - ONE

11. **Fill-In Speaker Amplifier** – Basis of Design for FILL-IN AMPLIFIER is BOGEN V-250. Approved manufacturers: Bogen, Crest-Audio, QSC. The FILL-IN speaker amp shall have a power rating of 60 watts. The amplifier shall provide one low-impedance balanced microphone input, one dedicated

Hi-Z auxiliary input, and one dedicated telephone line input as well as a fourth input that is switch selectable to be either a microphone or auxiliary input. The microphone inputs shall be equipped with filters to protect against RF interference, independent volume controls for each input as well as TREBLE control. The amplifier shall contain a TEL volume control to adjust the telephone paging level and a VOX volume control to adjust the TEL input signal trigger point for automatic muting of the AUX input. The amplifier shall provide output impedances of 4 – (direct), 8, 16-ohm speaker systems as well as 25V and 70V constant voltage systems. Two high-impedance outputs shall be provided to drive a tape recorder or booster amplifier and, when used with an accessory transformer, to feed a 600-ohm telephone line. The amplifier shall contain a thermostat capable of resetting the power transformer to protect against heat build-up and short-circuited or overloaded connections. Included rack mounts for standard rack mounting. (2 RU)

QUANTITY - ONE

12. **Wired Microphone** - Basis of Design for HANDHELD MICS is Shure SM58s. Approved manufacturers: Shure, Audio-Technology, EV. The HANDHELD MICS shall be unidirectional with a frequency response from 50 to 15,000 HZ. Rated impedance shall be 150 ohms low impedance. The mic connection point shall be by a 3 pin XLR connector. The mic element shall be covered by a steel mesh grill.

    QUANTITY – TWO

13. **Lockable Drawer** – Basis of Design for LOCKABLE DRAWER is LOWELL L18-193L. Approved manufacturers: Lowell, Atlas, Middle Atlantic. The drawer is 19”W for rack mount use. Drawer shall have panel space height of (2RU) and a maximum extension of 15.375” Construction shall be welded 16 gauge USA steel with ball bearing slides and positive stops. Load capacity shall be 50LBS. Finish shall be black powder epoxy.

    QUANTITY – ONE

14. **Power Conditioner** – Basis of Design for POWER CONDITIONER shall be an AVLEX PC-08. Approved manufacturers: Avlex, Furman, Monster. The POWER CONDITIONER shall have eight switched AC outlets. Also, the conditioner shall have two light modules with dimming capability, adjustable swivel and pull out positioning. The eight circuits shall be rated at 15 amps, equivalent to 1800 watts at 120 volts.

    QUANTITY – ONE

15. **Equipment Rack** – Basis of Design for EQUIPMENT RACK is LOWELL L260 SERIES. Approved manufacturers: Lowell, Atlas, Middle Atlantic. The EQUIPMENT RACK shall be fully welded 16 gauge US steel with vented side, a 14 gauge steel bottom and reinforcement at all load bearing junctures. Front and rear mounting rails shall be fixed in place. Top entry and a 6” deep rear conduit plane for knockouts shall be provided. Rack space requirements will be determined by individual contractor.

    QUANTITY – ONE

16. **Floor Rack Diagram** –

FLOOR RACK (Refer to A.3 for Blank Panels)

ASSITIVE LISTENING TRANSMITTER
POWER CONDITIONER
8 CHANNEL POWER VECTOR MIXER
8 CHANNEL POWER VETOR MIXER

CD/CD WRITER
WIRELESS HANDHELD RECEIVERS
WIRELESS HANDHELD RECEIVERS
STORAGE DRAWER W/LOCK
DIGITAL EQUALIZER
ANTENNA COMBINER
AMPLIFIER 1 (MAIN)
AMPLIFIER 2 (FILL-IN SPEAKER)

17. **Microphone Stands –** Basis of Design for MICROHONE STANDS is BOGEN SF4s. Approved manufacturers: Bogen, Exo, Tascam. The MICROPHONE STANDS shall be full height professional grade with a low profile base black in color. The stands shall be constructed of 5/8" and 7/8" diameter heavy-duty welded cold rolled tubing with 5/8" – 27 male thread termination to accommodate standard microphone holders. Top and bottom lock-nut rings are included for versatile and secure positioning. The one-piece low silhouette cast iron includes anti-tip stabilizers.

    QUANTITY – TWO

18. **Microphone Plates (Jacks)** – Basis of Design for MICROPHONE PLATES is RAPCO SP1-DF. Approved manufacturers: Rapco, Switchcraft, Shure. The MICROPHONE PLATES shall be single gang stainless steel with one female XLR jack mounted on plate. Three on the wall below the front edge of stage evenly spaced across the width of the stage. One on the stage right wall, one on the stage –left wall, and one on the back wall of the stage. Floor pockets or floormounted jacks will NOT be allowed.

    QUANTITY – SIX

19. **Main Speaker Cable** – Basis of Design for MAIN SPEAKER CABLE is BELDON 5000UE. Approved manufacturers: Beldon, Monster, Tappan or equal. The MAIN SPEAKER CABLE shall be 12 AWG copper cable with conductors. The cable must be UL listed and be made in the USA. Cables installed in a plenum environment must be plenum rated, otherwise PVC jacket will be accepted. Each speaker shall have its own individual homerun.

20. **Monitor Speaker Cable** – Basis of Design for MONITOR SPEAKER CABLE is TAPPAN P40020.1. Approved manufacturers: Beldon, Monster, Tappan or equal. The MONITOR SPEAKER CABLE shall be a 18 AWG 7 – strand copper cable with two copper conductors. The cable must be UL listed and be made in USA. Cables installed in a plenum environment must be plenum rated, otherwise PVC jacket will be accepted.

21. **Fill In Speaker Cable** – Basis of Design for FILL IN SPEAKER CABLE is TAPPAN P40020.1. Approved manufacturers: Tappan, Beldon, monster or equal. The FILL IN SPEAKER CABLE shall be a 18 AWG 7 – strand copper cable with two copper conductors. The cable must be UL listed and be made in USA. Cables installed in a plenum environment must be plenum rated, otherwise PVC jacket will be accepted. Fill In Speakers may be daisy chained.

22. **Microphone Field Cable** – Basis of Design for Microphone Cable is TAPPAN R20008.1. Approved manufacturers: Tappan, Beldon, monster or equal. The MICROPHONE CABLE shall be a 22 AWG shielded 7 strand 1 pair copper cable. The cable must be UL listed and made in USA. Cables installed in a plenum environment shall be plenum rated, otherwise PVC will be accepted. All microphone cables to be individually homerun.

23. **Microphone Portable Cable** – The MICROPHONE PORTABLE CABLE shall have 22 AWG 7 strand center conductors. The conductors shall have a 95% low loss spiral wound shield with a black ultra-flexible rubber jacket. Cables shall be terminated with a three pin female XLR connector on one end a three pin XLR male connector on the other end. 25" cables shall be included.

QUANTITY - FOUR

C. EXECUTION

1. A qualified “System Contractor” shall install the sound system complete except for the conduit/raceway. “System Contractor” shall have 5 years’ experience in the specific field of sound system installations of this kind. “System Contractor” shall submit single line drawings showing equipment locations and interconnections between all equipment supplied.

2. The system shall be installed using the latest technology and with good engineering practices. All cables shall be tested for opens, shorts and grounds prior to the hook-up of any cables to equipment. The system shall be balanced for optimum coverage for the room. Digital EQ shall be set and locked.

END OF SECTION 26 77 62

SECTION 27 00 01 – STRUCTURED WIRING

A. GENERAL

Work under this section shall be subject to the General, Supplemental General and Special Conditions and, together with this section, are a part of the contract.

1. DESCRIPTION OF WORK

a. It is the purpose of this specification to require the furnishing of the highest quality materials, equipment, and workmanship available; to fulfill the requirements of the work specified herein.

b. The Structured wiring infrastructure shall include a complete Network Infrastructure which includes a Category 6 UTP Data Cabling Infrastructure and a complete Collapsed Fiber Distribution network. All associated network electronics switches including core data switch are provided by owner. NOTE: All CAT-6 **plenum cabling** shall be provided by the structured wiring contractor for data, camera, Staff SIP Phone, access point, and TV locations.

c. Work Included

1) Provide all labor, equipment, supplies, materials, and incidentals and all operations necessary for the "TURNKEY," fully operational, tested, and completed installation of a Structured Wiring Infrastructure, in complete accordance with the Contract Documents. All material shall be made in the United States of America.

2) The work shall include, but not be limited to, the following:

a) Coordination of the Raceway installation
b) Furnish any special Back Boxes, as indicated on the drawings, for installation under Division 26.
c) Provide all freestanding 84” equipment racks: (5) at MDF Room F101, (2) 7ft racks with rail systems at each IDF Data closet, also provide and install all cable runways, cable management, power strips, fiber and copper patch panels, faceplates, patch cords, connectors, etc. for a complete installation.
d) Provide a 7ft double cabinet-rack unit in the Technology room F101 for the UPS provided under the allowance. Refer to Architect’s Allowances Section 01 21 00. Coordinate closely with owner prior to ordering rack.
e) Provide a complete CAT 6 and 12 strand multi-mode 50 micron OM3 fiber cabling infrastructure to support the systems provided herein.
f) Provide product demonstrations as required by the Owner.
g) All voice lines for fire alarm system and Building Automation (BAS) intrusion detection shall be provided and installed as part of the contract. Coordinate with those system contractors.
h) Refer to drawings for Data/Voice/Staff Phone/TV/Access point and I/P camera locations.
i) All Cat 6 wiring for Staff Phones, Wireless Access Points (WAP) and I/P Cameras shall be part of the base bid. Provide wire colors as follows: Data (blue), Cameras (green), Wireless Access Points (yellow). Please note, at end s of cables of Cameras and Access Points, contractor shall provide SMB connector and 3ft plenum patch cords.
j) Prior to installation of cabling and data racks a pre-installation meeting shall take place between the architect/engineer/owner/contractor.
k) Audio-visual wiring (HDMI, VGA & mini audio) shall be provided and installed between projector locations and AV locations at the Gymnasium Stage as indicated on plans.

2. FCC APPROVAL

The system shall be approved for direct interconnection to the telephone utility under Part 68 of FCC rules and regulations. Systems which are not FCC approved or utilized an intermediary device for connection, shall not be considered. Provide the FCC registration number of the system being proposed as a part of the submittal process.

3. PRODUCT DEMONSTRATIONS

The Systems Contractor may be required to provide product demonstrations and interviews with the Owner and his representatives or may be required to provide side-by-side demonstrations with other vendors. These demonstrations may be required before a contract is issued. Offerers should be prepared to demonstrate each feature called for in this specification.

4. SUBMITTALS

Submit the following Shop Drawings and Submittals, per the schedule listed below for review by the Architect:

a. Prior to proceeding with the work

b. A complete schedule of ALL equipment and materials to be furnished for the work. Accompanying the schedule shall be manufacturer's specification or cut sheets for all major components listed in Section 2 of this specification.

1) Shop Drawings

2) Complete shop drawings for all systems and assemblies specified. Each drawing shall have a descriptive title and all subparts of each drawing shall be labeled. All drawings shall have the name and location of the project and the Systems Contractor's name in the title block.

3) Cabinets & Assemblies - Complete scaled drawings of all equipment racks, consoles, special assemblies, etc. Each drawing shall show all equipment with its manufacturer and model number.

4) Device Locations - Complete, scaled building drawings detailing installation locations of all equipment, such as control panels, plug panels, TV monitors, equipment racks, speakers, etc. All conduit with cable quantities and types and all terminal block locations shall also be indicated.

5) Device Layout - Complete scaled drawings detailing all device plates, plug panels, input/output panels, rack panels and custom components to be fabricated by the Systems Contractor. Include the same details for all custom or non-standard components to be furnished by vendor/manufacturers of the Systems Contractor. Show all connectors, mounting devices and labeling details on these drawings.

6) System Diagrams - Detailed one line drawings of all systems. Each system drawing shall detail the field wiring and wiring within racks and consoles. Each drawing shall show proposed (and eventually as built) circuit numbers for all cables and terminal connections. Provide typical wiring termination details for all devices.

7) Sales staff or technicians shall not provide training. The contractor must show evidence of having a full time CSR’s on staff. If the contractor does not employ CSRs Training by factory personnel for 120 hours of staff development will be required. The cost of the trainers travel expenses shall be included in the bid. Please note training will be provided in multiple sessions at the customer’s convenience.

8) Systems Contractor certificates as described in Paragraph 2.1 and in the Data Infrastructure Sections of this specification.

9) A list of test equipment, giving makes, models and serial numbers for all equipment to be used for testing, and alignment of systems. Include certification of Ownership and familiarity with the operation of the following minimum test equipment:

   a) Low distortion sine wave oscillator
   b) Distortion analyzer
   c) AC impedance bridge
   d) Oscilloscope
   e) Sound level meter and octave band filter set
   f) Multimeter with true RMS-AC measurement capability
   g) RF Field Strength Meter
   h) LAN cable meter with NEXT and attenuation functions
   i) Optical power loss meter, with light source
   j) Optical Time Delay Reflectometer (OTDR)

10) Systems Contractor certificates as described in the Data Infrastructure Sections of this specification.

c. Prior to proceeding with respective portions of work

Art work drawings, and listings indicating proposed nameplate nomenclature and arrangements for control panels, plug panels, and nameplates prior to fabrication.

1) Front panel layouts for all equipment racks, prior to installation, reflecting equipment to be used.

2) Details and descriptions of any other aspect of the system which differ from the contract drawings due to field conditions or due to the equipment furnished.

3) Submittal as otherwise noted on the drawings and/or as noted herein.

4) Approved shop drawings and instruction brochures, including schematic diagrams for all electronic devices, shall be present at the job site during the period set aside for system testing.

d. At Project Completion

1) As-Builts - Prior to final acceptance, provide three complete sets of drawings showing all cable numbers and construction details in accordance with the actual system installation. Revise all shop drawings to represent actual installation conditions.

2) Operation And Maintenance Manuals - Prior to final acceptance, provide three complete sets of operation and maintenance manuals for the system. The operation manual shall contain all instruction necessary for the proper operation of the installed system and manufacturers' instruction. The maintenance manual shall contain all "proof of performance" information as required in Section 3, and all manufacturers' maintenance information, and copies of all computer programs and system set up disks documenting all programmable features for the installed system. Manufacturers not offering factory authorized certification for district maintenance personnel will not be considered equal.

3) Statement of Warranty Coverage - Provide comprehensive warranty statement listing start & end dates of all items under warranty list items covering the required 1 year warranty.

5. DEFINITION OF TERMS

The term "Systems Contractor" shall refer to the person, persons, or company who or which actually contracts to perform the Structured Wiring System work specified herein.

6. CONTRACTOR QUALIFICATIONS

   a. The Contractor must be a "Systems Contractor" who has been regularly engaged in the furnishing and installation of communications and telephone systems for a period of at least the last five (5) years and who can show evidence of successfully completing, with its present staff, at least five (5) projects of similar size and scope, including the multimedia resource management. The Systems Contractor, not its employees, must meet these contractor qualifications. With the submittal, provide a list of jobs completed, with contact, address and phone number of the owner and the Systems Contractor's key employees assigned to the project, listing their responsibilities during the job and the length of time with the contractor in this capacity.

   b. The Systems Contractor shall demonstrate to the satisfaction of the Architect/Engineer that it has:

      1) Adequate plant and equipment to pursue the work properly and expeditiously.
      2) Adequate staff and technical experience to implement the work.
      3) Suitable financial status to meet the obligations of the work.

   c. The Systems Contractor shall:

      1) Hold a valid SPLV Contractors License for the State of North Carolina, issued by the North Carolina Board of Electrical Examiners.
      2) Be a factory authorized sales and installation contractor for all products used in the project.

   d. Any contractor, who intends to bid on this work and does not meet the requirements of the "Contractor Qualifications" paragraph(s) above, shall employ the services of a "Systems Contractor" who does meet the requirements and who shall furnish the equipment, shop fabricate the equipment racks and subassemblies, make all connections to equipment and equipment racks, make all connections to remote controls and connection panels, and continuously supervise the installation and connections of all system cable and equipment.

   e. A subcontractor so employed as the "Systems Contractor" shall be acceptable to the Architect/Engineer and shall be identified in the submittal.

7. QUALITY ASSURANCE

   a. General - All equipment and materials required for installation under these specifications shall be new (less than 1 year from date of manufacture) and without blemish or defect.

   b. Specific - Each major component of equipment shall have the manufacturer's name, address and model number on a plate securely affixed in a conspicuous place. NEMA code ratings, UL label, or other data which is die-stamped into the surface of the equipment shall be easily visible.

   c. Substitutions

      1) It is not the intent of these specifications to limit or restrict submission of proposals for products by other manufacturers but to set a baseline of operational performance and functions which all bidders must meet.

      2) Where a specific piece of equipment has been discontinued and/or replaced by a new model, submission of the new model does not guarantee acceptance. Substitute items shall require evaluation by the Architect/Engineer, Owner or their agent prior to acceptance.

3) If substitute equipment is allowed even by an approved submittal, the ICS Contractor shall be completely responsible for its use and for its ability to fulfill all intended functions in the completed systems. The Structured Wiring Contractor shall replace all such equipment with equipment listed by type and model number in the specifications if there is any evidence of equipment instability and/or incompatibility.

4) Any use of substitute equipment shall be at no extra cost to the Owner.

5) If a Bidder wishes to propose substitute equipment and /or a system to meet all the functional requirements of this specification but deviates from the equipment or system herein, by individual components or entire design philosophy, he is encouraged to do so. To be considered, the substitutes must be accepted “as equal” in a written addenda at least 15 working days prior to the date bids are to be received. To be considered, submit the information required by this specification under “Submittals – Prior to proceeding with the work” for review by the Architect/Engineer and be prepared to provide an on-site demonstration of the system proposed.

B. MDF AND IDF EQUIPMENT RACKS

1. OPEN RELAY RACKS

a. Provide four (4) 84” two-post data racks and (1) double network rack for own UPS @ F101 and two (2) 84” two-post data rack at each IDF closet. (Rooms D104, D115.2, E105.1, E115.2, G104 and G115.2), each rack shall include:

1) 10-outlet surge protected power strip with 10’ cord at each rack.
2) Grounding bar at each MDF/IDF room.
3) Shelves for Owner provided equipment, coordinate with Owner at each rack.
4) Horizontal and veritical wire management at each rack.
5) All support accessories needed for a neat installation in accordance with EIA/TIA requirements.

C. DATA CABLE INFRASTRUCTURE (PLENUM-RATED) (Color Blue)

1. Twisted Pair Cable

a. Cabling shall be unshielded twisted pair (UTP) and shall meet EIA/TIA-568, TSB-36 requirements for Category 6 (Plenum rated). Provide UTP cable with the following minimum features:

1) Conductors: Cat 6, 24 AWG solid copper, 4 pair; (CMP)
2) Impedance: 100 ohms +/-15% at 1-100 MHz;
3) DC Resistance: 8.9 ohms/100 meters (27.1 ohms/Mft) maximum;
4) Mutual Capacitance: 46 pF/M (14pF/ft) nominal;
5) Attenuation (per 1000 ft):

a) 1.8 dB at .772 MHz
b) 3.8 dB at 4 MHz
c) 5.9 dB at 10 MHz
d) 7.5 dB at 16 MHz
e) 8.4 dB at 20 MHz
f) 10.6 dB at 31.25 MHz
g) 15.3 dB at 62.5 MHz
h) 19.7 dB at 100 MHz
i) 25.0 dB at 155 MHz
j) 28.8 dB at 200 MHz
k) 36.2 dB at 300 MHz
l) 39.5 dB at 350 MHz

m) 42.7 dB at 400 MHz
n) 48.6 dB at 500 MHz
o) 51.5 dB at 550 MHz
p) 54.2 dB at 600 MHz
q) 56.8 dB at 650 MHz

Note: blue – data, white – intercom staff phones, green – I/P Camera, yellow – wireless access points. Made in the United States of America.

b. Provide one "homerun" UTP cable between each data outlet port indicated on the drawings and the appropriate Local Owner provided switches.

c. UTP cables shall not exceed 90 meters from the data outlet port to the appropriate Owner provided switches.

d. The 2017 National Electric Code Article 800 Type CMP specification shall be considered when UTP cables are installed, without benefit of adequate raceway, in a plenum air return. (Provide non-plenum-rated wiring on this project).

2. Fiber Optic Cable (Plenum-rated)

a. Provide 12 -strand multimode fiber optic (Plenum rated) cabling with the following features:

1) Glass type shall be 50 micron core, OM3. Aqua color.
2) Each cable shall have a minimum short term bend radius of 10X the cable diameter.

b. In-field splicing of fiber optic cables shall not be permitted.

c. Plenum fiber optic cables shall be Corning or equivalent. (Made in U.S.A)

3. Fiber Optic Connectors

a. Provide Fiber Optic connectors with the following features:

1) Connectors shall be SC compatible, multi-mode type;
2) Connector tip material shall be ceramic;
3) Connectors shall accept a maximum fiber jacket diameter of 3.0 mm;
4) Connectors shall be spring loaded, bayonet style for a positive contact;
5) Connectors shall be keyed to prevent rotation after insertion;
6) Connectors shall utilize cured adhesive methods for assembly;
7) Attenuation through connectors shall be less than .3 dB;
8) Epoxy-less, mechanical crimp-style fiber optic connectors are not acceptable;

b. Fiber Optic connectors shall be Siecor or equivalent.

4. Data Station Outlet

a. Face plates

1) Provide Data Station Outlets as indicated on the drawings with the following features:

a) Single gang, flush mountable, almond colored plastic construction;
b) Shall accept data, telephone, fiber optic, MATV, video, audio and blank insert modules;
c) Shall have the capability to accept up to six individual ports;
d) Inserts shall snap in and out from the front of the Data Station Outlet;
e) Face plates shall be supplied with pressure-sensitive icon labels;

b. Inserts

1) Provide Data Port inserts with the following features:

a) RJ-45 type rated for Category 6;
b) RJ-45 insert shall be configured to EIA-568B wiring standards.;
c) Attenuation through the RJ-45 port at 10/16 MHz shall be less than .015/.025 dB;
d) Provide 110 style IDC terminations for all eight conductors of a UTP cable;
e) Colors inserts: blue – data, white – paging-intercom staff phones, green – I/P Camera, yellow – wireless access points

5. Patch Panels

a. Patch panels shall be provided at each IDF/MDF for termination of all UTP and fiber optic cables. Patch panels shall have the following features:

b. Patch Panels for Twisted Pair Cable

1) MDF/IDF panels shall be mountable in EIA standard 19" equipment racks;
2) MDF/IDF panels shall be rated for Category 6;
3) Each panel shall provide a minimum of twenty-four RJ-45 ports in one rack space position (1RU);
4) Each RJ-45 port shall provide 110 style IDC terminations for all eight conductors of a UTP cable;
5) RJ-45 ports shall be configured to EIA-568 wiring standards;
6) Attenuation through the RJ-45 port at 10/16 MHz shall be .015/.025 dB;
7) MDF/IDF panels, provide one (1) RJ-45 port for each data station outlet port and each vertical riser cable, plus 20% percent for future expansion;
8) Clearly label each patch point with the location of its associated data station port;

c. Provide a three (3) foot and a ten (10) foot minimum Category 6 UTP patch cable for every Category 6 UTP data cable terminated at a patch panel. Install and neatly route patch cables between the panel and the switches utilizing cable management hardware. Contractor shall also provide an additional 50-3ft and 25-10ft patch cords. Contractor shall also provide 3ft plenum patch cords for all SMB connectors at the WAP and Camera locations.

d. Patch Panels for Fiber Optic Cables

1) MDF/IDF panels shall be mounted in open relay racks/cabinets;
2) MDF/IDF panels shall provide SC-SC feed-through connectors for termination of fiber optic strands; coordinate with owner;
3) MDF/IDF panels shall provide space for at least three feet of fiber optic cable management and excess patch cable storage in a pull-out drawer;
4) Clearly label each fiber optic SC patch position with the location of its origin;
5) MDF panels shall be capable of terminating all fiber optic strands with 20% spare loaded ports;

e. Provide (1) 3 foot and (1) 6 foot minimum fiber optic patch cable for every fiber strand in the system. Install and neatly route patch cables between the panel and the hubs, utilizing cable management hardware (fiber patch cable shall be SC to LC). Verify with Owner prior to purchase.

f. Provide horizontal and vertical in racks cable management panels between each patch panel for twisted pair cable. Cable management panels shall be panduit “WMP” series, or equal.

g. Provide fiber management systems at the MDF/IDF locations.

6. Systems Contractor shall be factory certified to install the Data Cabling Infrastructure. The Systems Contractor shall include a copy of the factory-provided 25 year certification with his submittal.

7. Certification

   a. Systems Contractor shall be factory certified to install the Data Cabling Infrastructure. The Systems Contractor shall include a copy of the factory-provided 25 year certification with his submittal.

   b. Contractor shall verify and test with owner's equipment installed. The complete operation of equipment is to make sure cabling is installed correctly.

8. Systems contractor shall provide and install patch cables/ extension cables for Cat-6, and HDMI between the projector ceiling pan outlet and the owner provided projector. This work shall be included as part of the contract. Coordinate closely with Owner and Electrical Contractor prior to rough-in of conduit, receptacles, communication outlet boxes and projector ceiling pans.

D. EXECUTION

1. GENERAL

   a. Perform the work in accordance with acknowledged industry and professional standards and practices, and the procedures specified herein.

   b. Furnish and install all materials, devices, components, and equipment for complete operational systems.

   c. Maintain a competent supervisor and supporting technical personnel, acceptable to the Owner, during the entire installation. Change of the supervisor during the project shall not be acceptable without prior written approval from the Architects.

   d. Coordinate all efforts with those of related trades. In the event of any conflicts, delayed or improper preparatory work by others, notify the Architect. The Architect's decision shall be binding. Verify all field conditions.

   e. If additional conduit sleeves are needed for routing cabling it shall be provided and sealed as needed at no additional expense to Owner.

2. INSTALLATION OF SYSTEMS

   a. Device Locations - Locate all apparatus requiring adjustments, cleaning, or similar attention so that is shall be accessible for such attention. Equipment racks shall be positioned to permit full access for operation and service.

   b. Blank And Custom Panels - Finish of blank panels and custom assembly panels shall match adjacent equipment panels as closely as possible.

   c. Markings - Switches, connectors, jacks, receptacles, outlets, cables, and cable terminations shall be logically and permanently marked. Custom panel nomenclature shall be engraved, etched, or screened. Marking for these items are purposely detailed on the drawings to ensure consistency and clarity. Verify any changes in working type size, and/or placement with the Architect prior to marking.

d. Environment - The equipment specified herein is designed to operate in environments of normal humidity, dust, and temperature. Protect equipment and related wiring during installation where extreme environmental conditions can occur.

3. ELECTRICAL POWER

a. Grounding - Review and coordinate electrical power system installation including grounding, with the Division 26 Prime Contractor to ensure proper operation of the system.
b. Verification - Verify that all AC power circuits designated for the system are properly wired, phased, and grounded. Report in writing any discrepancies found to the Division 16 Prime Contractor for corrective action.

c. Equipment Rack - Provide distribution of electrical power within the equipment racks with a minimum of two spare AC receptacles per branch circuit, used in the racks.

4. CLEANING

a. Clean all junction and terminal box interiors thoroughly before installing plates, panels, or covers.

5. WIRING METHODS & PRACTICES

a. Identification - All wires shall be permanently identified at each wire by marking with "E-Z" tape marker or equivalent.

b. Terminal Blocks - All terminal block connections shall be readily accessible. Not more than two wires connected to one terminal. Spare terminal blocks, equivalent to 10% of those in actual use shall be provided.

c. Splicing - Splicing of cables shall not be permitted between terminations of specified equipment.

d. Pulling Cable - Do not pull wire or cable through any box fitting or enclosure where change of raceway alignment or direction occurs. Do not bend conductors to less than recommended radius. Employ temporary guides, sheaves, rollers, and other necessary items to protect cables from excess tension, abrasion, or damaging bending during installation.

e. Cable Tie - Form in a neat and orderly manner all conductors in enclosures and boxes, wireways, and wiring troughs, providing circuit and conductor identification. Tie as required using T & B "Ty-Raps" (or equivalent) of appropriate size and type. Limit Spacing between ties to six inches and provide circuit and conductor identification at least once in each enclosure.

f. Service Loops - Provide ample service loops at each termination so that plates, panels, and equipment can be demounted for service and inspection.

g. Wiring Harnesses

1) All wires and cables used in assembling custom panels and equipment racks shall be formed into harnesses which are tied and supported in accordance with accepted Engineering practice.

h. All fiber strands shall be terminated at fiber patch panels.

i. All components used in plenum environment shall be plenum rated.

6. EQUIPMENT RACKS

a. General - The equipment racks locations and arrangements shall be coordinate with owner prior to installation.

b. Equipment Location - Placement of equipment in equipment racks, as indicated in the drawings, is for maximum operator convenience. Verify any changes in placement prior to assembly. All system components and related wiring shall be located with due regard for the minimization of induced electromagnetic and electrostatics noise, for the minimization of wiring length, for proper ventilation, and to provide reasonable safety and convenience for the operator.

c. Rack Installation - Racks shall be installed plumb and square without twists in the frames or variations in level between adjacent racks.

d. Identification - All terminal blocks, and rack mounted equipment shall be clearly and logically labeled as to their function, circuit, or system as appropriate. Labeling on manufactured equipment shall be engraved plastic laminate with white lettering on black or dark background that is similar to panel finish.

7. ACCEPTANCE TESTING

a. The Acceptance Testing shall be performed by the Owner or the Owner's agent. Coordinate this period so that free access, work lighting, and electrical power is available on the site.

b. Be prepared to verify the performance of any portion of the structured cabling system by demonstration, viewing tests, and instrumented measurements.

c. Make additional mechanical and electrical adjustments within the scope of work and which are deemed necessary by the Owner as a result of the acceptance test.

8. SYSTEM DOCUMENTATION

a. Prior to final acceptance tests, submit to the Architect, three copies of an operating and maintenance manual for the system that has been installed. These manuals shall be used during the final acceptance testing of the system. Each manual shall contain the following information:

1) Accurate as-built drawings including the following:

- Test Results
- Laminated drawings with ID numbers, hung in MDF
- AutoCAD CD with test results and drawings

2) Operations and maintenance manuals

3) Test results for all fiber and copper cabling

9. WARRANTY

a. The Contractor shall guarantee all components and labor of the work defined in this specification for a period of one year after final acceptance by the Owner. The following conditions shall apply:

1) The Contractor shall provide service within eight (8) hours, after notification by the Owner or his representative, within the hours of 8:00 a.m. to 5:00 p.m. from Monday through Friday. Service Request forms shall be supplied to the Owner and the faxing or mailing of such a request form shall constitute notification by the Owner of a service request.

SECTION 27 51 13 – INTERCOM SYSTEMS

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

A. The conditions of the General Contract (General, Supplementary, and other Conditions) and the General Requirements are hereby made a part of this Section.

B. All bids shall be based on the equipment as specified herein. The catalog numbers and model designations are that of the Bogen Nyquist E7000 Series Educational System (or equal). The specifying authority “owner” must pre-approve any alternative system. This system shall be provided under an allowance. Refer to Architect’s List of allowances section 01 21 00.

C. Contractors who wish to submit alternative equipment shall provide the specifying authority with the appropriate documentation at least 15 business days prior to bid opening. The submitted documentation must provide a feature by feature comparison identifying how the proposed equipment meets the operation and functionality of the system described in this specification. Prior to bid date, the contractor shall provide adequate and complete submittal information, prior to bid date, which shall include but not be limited to specification sheets, working drawings, shop drawings, and system demonstration. The alternative supplier-contractor must also provide a list to include six installations identical to the proposed system.

D. The contractor shall provide the FCC registration number of the proposed system, where applicable.

E. Final approval of the alternative system shall be determined at the time of job completion. Failure to provide the "precise functional equivalent" shall result in the removal of the alternative system at the contractor’s expense.

F. The contractor for this work shall have read all the bidding requirements, the general requirements of division 1, and the contract proposal forms, and shall be held to the execution of this work. The contractor shall be bound by all the conditions and requirements therein.

G. The contractor shall be responsible for providing a complete functional system, including all necessary components whether included in this specification or not.

H. In preparing the bid, the contractor should consider that no claim will be made against the owner for any costs incurred by the contractor for any equipment demonstrations requested by the owner.

I. All conduit, outlet boxes, power supplies, and receptacles shall be provided and installed by the electrical contractor as part of the base bid.

1.02 SCOPE OF WORK

The contractor shall furnish and install all equipment, accessories, and materials in accordance with these specifications and drawings to provide a complete and operating VoIP school communications system including but not limited to:

A. Analog Station Bridge (ASB) as required

1. 24 station interface supporting analog speakers and call switches
2. Built-in 2x120W power amplifiers
3. Two speech links

4. Category wiring
5. 25/70-volt speaker(s), ceiling-mounted, wall-mounted, and paging horns
6. Analog/Mechanical Call Switches capable of placing Normal, Urgent, or Emergency priority calls

7. CAN Bus 2.0 interface designed for future support of a Digital Call Switch that can initiate Normal, Urgent, or Emergency priority calls, all with options for Privacy Mode

B. Matrix Mixer Pre-Amplifier (MMPA) as required

1. Four Mic/Line inputs that are user-configurable
2. Line-Level/Monitor output
3. Digital AES/EBU (AES3) input

C. Input/Output (I/O) Controller as required

1. Eight inputs to monitor third-party device events
2. Eight outputs to initiate third-party device actions
3. Power over Ethernet (PoE) Class-1 (IEEE 802.3af compliant)

D. Built-in Master Clock with the following minimum features:

1. Unlimited Events
2. Unlimited Concurrent Schedules
3. Unlimited Holidays

E. Educational System Software shall be installed on a dealer or a customer-supplied server with the following minimum specifications:

1. Web Server for full system configuration and operation

2. Administrative User Interface (Admin Web UI) for programming and day-to-day system operation, including but not limited to:
   a. Station intercom two-way calling
   b. Zone Paging with software-adjustable volume per zone
   c. Emergency Paging
   d. Playing Emergency Tones
   e. Playing Tones
   f. Playing Announcement Files
   g. Managing Bell Schedules
   h. Weekly Bell Schedule Review at-a-glance
   i. Audio Distribution
   j. System muting

F. Teacher’s Dashboard web-based UI for teachers, including but not limited to:

1. Directory
2. Dial Pad
3. Voicemail
4. Call Forwarding
5. Single-click or touch Normal or Emergency calling
6. Single-click or touch 911 calling

G. VoIP Admin Phone, PoE, 7" 800 x 480-pixel color touch screen with backlight as required

H. VoIP Staff Station, PoE, 132 x 64-pixel graphical LCD with backlight as required

I. Owner Telephone System Connectivity

1. System shall be capable of connecting to the Public Switched Telephone Network (PSTN), analog Public Branch Exchange (PBX), or digital PBX/IP-PBX by connecting to an unlimited number of SIP trunks, analog FXO/FXS lines, or CO Trunks.

2. Telephone service with public utilities will be arranged by the owner in conjunction with the equipment supplier. Equipment supplier shall generate a one-page document that will provide the owner with the number of outside lines.

1.03 SUBMITTALS

A. Specification Sheets shall be submitted on all items including cable types

B. Submit Outline drawing of system control cabinet showing relative position of all major components

C. Shop drawings, detailing integrated electronic communications network system including, but not limited to, the following:

1. Station wiring arrangement

2. Equipment cabinet detail drawing

D. Submit wiring diagrams showing typical connections for all equipment

E. Submit a numbered Certificate of Completion for installation, programming, and service training, which identifies the installing technician(s) as having successfully completed the technical training course(s) provided by the system manufacturer.

1.04 QUALITY ASSURANCE

A. All items of equipment shall be designed by the manufacturer to function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all interconnections.

B. The contractor shall be an established communications and electronics contractor that maintains a locally run and operated business and has done so for at least 10 years. The contractor shall be a duly authorized distributor of the equipment supplied with full manufacturer's warranty privileges.

C. The contractor shall show satisfactory evidence, upon request, that he or she maintains a fully equipped service organization capable of furnishing adequate inspection and service to the system. The contractor shall maintain at his or her facility the necessary spare parts in the proper proportion as recommended by the manufacturer to maintain and service the equipment being supplied.

1.05 SINGLE SOURCE RESPONSIBILITY

A. Except where specifically noted otherwise, all equipment supplied shall be the standard product of a single manufacturer of known reputation and a minimum of 35 years of experience in the industry. The

supplying contractor shall have attended the manufacturer's installation and service training classes. A certificate of this training shall be provided with the contractor's submittal.

1.06 SAFETY / COMPLIANCE TESTING

The communications system and its components shall, where applicable, bear the label of a Nationally Recognized Testing Laboratory (NRTL), such as Environmental Technology Laboratory (ETL), and shall be listed by their re-examination service. All work must be completed in strict accordance with all applicable electrical codes, under direction of a qualified and factory-approved contractor, and to the approval of the owner.

1.07 IN-SERVICE TRAINING

The contractor shall provide a minimum of eight hours of in-service training with this system. These sessions shall be broken into segments, which will facilitate the training of individuals in the operation of this system. User Guides shall be provided at the time of this training.

1.08 WIRING

A. System wiring and equipment installation shall be in accordance with generally-accepted engineering best practices as established by the EIA and the NEC. Wiring shall meet all state and local electrical codes. All wiring shall be tested to be free from grounds and shorts.

B. All system wiring shall be labeled at both ends of the cable. All labeling shall be based on the room numbers as indicated in the architectural graphics package.

C. Wiring shall be done per manufacturer's recommendation (Cat 6 or West Penn #357) depending on speaker type.

1.09 PROTECTION

A. The contractor shall provide all necessary transient protection on the AC power feed and on all station lines leaving or entering the building.

B. The contractor shall note on their system drawings, the type and location of these protection devices and all wiring information. Such devices are not to be installed above the ceiling.

1.10 SERVICE AND MAINTENANCE

A. The contractor shall provide a five-year equipment hardware warranty of the installed system against defects in material and workmanship. All materials shall be provided at no expense to the owner during normal working hours. The warranty period shall begin on 1st of the month following the date of shipment.

B. The contractor shall, at the owner's request, make available a service contract offering continuing factory authorized service of this system after the initial hardware and software warranty periods.

C. The system manufacturer shall maintain engineering and service departments capable of rendering advice regarding installation and final adjustment of the system.

PART 2 - SYSTEM SPECIFICATION

2.01 MANUFACTURERS

A. Manufacturers, subject to compliance with requirements specifications, provide the following system:

Bogen Nyquist E7000 Series Educational System manufactured by Bogen Communications, Inc. (or pre-approved equal) The System shall be provided under an allowance, refer to Architect's List of allowances section 01 21 00.

B. The specifying authority must approve any alternative system.

C. The intent is to establish a standard of quality, function, and features. It is the responsibility of the bidder to ensure that the proposed product meets or exceeds every standard set forth in these specifications.

D. The functions and features specified are vital to the operation of this facility; therefore, inclusion in the list of acceptable manufacturers does not release the contractor from strict compliance with the requirements of this specification.

2.02 EQUIPMENT

A. Nyquist NQ-E7030 Analog Station Bridge

1. 24 station support
2. 120W of total available power; max. 40W per any individual port
3. 25 Volt Speakers(s)
4. Analog Call Switch(s)
5. Software programmable configuration and operation
6. Rack mounted, wall mounted, or shelf mounted
7. CAN Bus 2.0 interface for future support for NQ-E7020 DCS

B. Nyquist NQ-P0100 Matrix Mixer Pre-amplifier

1. No less than four Line/Microphone Level Inputs used for:
    a. CD Player
    b. AM/FM Tuner
    c. Push-to-Talk Paging Microphone
    d. MP3 Player
    e. Digital AES/EBU (AES3) input
2. Line Level output to drive external amplifier
3. Software programmable configuration and operation
    a. Push-to-Talk Channel
    b. Push-to-Talk Type
    c. Push-to-Talk Zone
    d. Mixer Channels
4. Mixer Channels Wall or shelf mounted

C. Nyquist NQ-E7010 Input/Output Controller

1. Eight Dry Contact Inputs
2. Eight Open Collector Outputs

3. Software programmable configuration and operation including:
    a. Contact Type
    b. Extension
    c. Name
    d. Close Interval
    e. Actions including:
        i. Audio
        ii. Alarm
        iii. Announcement
        iv. Disable-Audio
        v. Other
        vi. Tone
        vii. Enable-Audio
    f. Action ID
    g. Zones
    h. Close Extension
    i. Dashboard Type
    j. Dashboard Title
    k. Dashboard Scope
    l. Dashboard Text
    m. Dashboard Style
    n. Email
4. Wall or shelf mounted

D. Nyquist Station Equipment

1. NQ-T1100 VoIP Admin Phone – Color Touch Display (aka Admin Station)
2. NQ-T1000 VoIP Staff Phone – LCD Display (aka Staff Station)
3. NQ-S1810WT VoIP Wall Baffle Speakers with talkback
4. NQ-S1810CT VoIP Ceiling Speakers with talkback
5. NQ-E7020 Digital Call Switch
6. CSD1X2UV Drop-In Ceiling Speaker
7. CA15C or CA21B Analog Call Switch

E. Optional Equipment

1. Telephony interface device(s) for FXO/FXS analog port connectivity

2.03 COMPONENTS AND DESCRIPTIONS

The Nyquist E7000 Series Educational System is a software-based VoIP paging and intercom system.

The Nyquist E7000 Series Educational System must be capable of supporting existing Bogen Multicom 2000 and Bogen Quantum Multicom IP wiring, 25 volt speakers and analog call-switches, and equivalent competitive systems utilizing the existing architectural numbering scheme. The VoIP capabilities of the Nyquist system will enable the support of the features across the various Nyquist appliances within the facility. The following sections define how the system handles each of the features in the system. Systems that do not allow the reuse of existing wiring or numbering scheme shall not be deemed acceptable. Systems that do not allow appliances to be seamlessly integrated via the LAN are not considered equal.

A. Nyquist E7000 Server Software

1. The Nyquist E7000 server software shall be installed on a dedicated dealer or customer supplied server. An unlimited number of facilities can be networked into a Nyquist-based District.

a. Minimum Nyquist Server Requirements

- Debian Linux OS (AMD 64-bit version) release 8.4.x – 8.8.0
- Quad-core Intel-based processor running at 3.0 GHz or higher
- 8 GB RAM
- One 250 GB disk drive
    - Redundant Array of Independent Disks (RAID) is recommended for redundancy and high availability.
    - Consider using a larger drive if large amounts of audio (for example, voice mail, announcements, recordings, and music) are being stored on the system. Other factors that should be considered are:
        - How often will backups be performed?
        - Will the system be backed up locally or remotely on a detachable drive, SAN/NAS, or NFS?
        - How many users will have voicemail ability?
        - How long will voicemail messages be stored?
        - Will voicemail messages be part of the local system backups?

- NIC 10/100/1000 MB Ethernet port
- One or more PCI/PCI Express (PCIe) slots if telephony network connectivity other than, or in addition to, SIP trunking
- One or more PCI/PCIe type third-party telephony interface cards (for example, FXO, FXS, etc.) if telephony network connectivity other than, or in addition to, SIP trunking

2. Audio shall be transmitted between the server and the Nyquist appliances using the customer supplied LAN/WAN using both G.722 and Opus 48k audio encoding and streaming technology to deliver High Definition audio quality. Systems that do not use G.722 and Opus for audio encoding and streaming shall not be deemed equivalent.

3. The Nyquist server software and Nyquist appliances software shall be upgradeable via the Nyquist Web UI.

4. It shall be possible for a Nyquist facility to make “station-to-station” calls and “remote facility” All-Call pages to a single facility or to all Nyquist facilities in a district via the Nyquist Web UI or an Admin Station. Systems that require remote viewing software or other application software to be installed/loaded on to additional servers or PCs to make station-to-station calls and remote facility All-Call or district paging shall not be considered equivalent.

5. The Nyquist server software is designed to handle all facility and district-wide communications, including but not limited to, inter-facility intercom calling and paging, district-wide Emergency All-Call and local facility point-to-point calls. Via the Nyquist Web UI, every facility shall be configured with the IP addresses of all the other remote facilities within the district.

6. Nyquist can support an unlimited number of facilities; however, the maximum number of simultaneous remote facility intercom calls supported is based on the actual performance of the WAN and the Nyquist Server CPU load.

7. The voice quality of the facility calls may vary based on the WAN conditions. The maximum network bandwidth that All-Call and Zone Paging uses is 64 kbps (Multicast G.722), and intercom calls use 128 kbps (unicast, G.722).

8. The system shall facilitate the repetitive playing of Normal or Emergency audio tones or announcements directed to a Paging Zone until stopped by the Nyquist user via the Web UI, an Admin Station, or a dry contact closure connected to the Nyquist I/O Controller NQ-E7010.

9. A built-in Master Clock shall be included to automatically control class change bells or other time-based signals. The Master Clock shall have an unlimited number of Events that may be programmed into any of the unlimited number of Schedules, and unlimited number of Holidays. The schedules shall be nameable for easy selection when assigning schedules to days or overriding a schedule.

10. Network Time Synchronization. The system shall be capable of periodically updating/synchronizing the processor's time with a Network Time Server running Network Time Protocol (NTP) via the school's LAN network. Systems that do not provide Network Time Synchronization will not be deemed equivalent. The Nyquist server can be the NTP server for other devices on the LAN such as IP clocks and other IP devices.

B. Nyquist Server Application

1. The Nyquist software is installed onto the server, and upon boot-up, users can log in to the Nyquist server application via a web browser that supports WebRTC. Systems that require Com Port redirect software, client PC application, software or serial-to-Ethernet adapters for user access are not deemed equal. Communications between the server and the Web UI(s) shall be via secure Hyper Text Transfer Protocol (HTTPS) connections (i.e., https://).

2. The Nyquist Web UI shall be configured with four different default user access levels, based on four unique user roles. Systems that do not provide unlimited access levels and unlimited user roles are not considered equal.

    A. The four default roles shall be: admin, optech, operator, and user. These roles provide a starting point/example for administrators to create additional roles.

3. Only a user assigned the admin role shall be able to provide access to users, giving them the ability to create, delete, edit, and view system parameters.

4. Only an Administrator shall have the ability to adjust roles and Class of Service (CoS) of users. The roles determine if users can view the definable data objects that can include configuration, alarms, and performance data and if users can perform certain operations based on the user's role and station's CoS. All changes to roles and CoS are effective immediately, without the need to restart the browser or reboot the server.

5. The Nyquist Web UI Dashboard shall provide full administrative capabilities to manage/operate the following system features:

    A. Calling/Paging – User can initiate a call by accessing the directory or by dial pad and can receive calls, make Zone Page and All-Call Page, make a Prepending Page, Emergency All-Call paging.
    B. Call Forwarding
    C. District Calling/Paging – Used for District Facility Page, District All-Call, and District Emergency All-Call.
    D. Tones/Announcements – Used to play Tones, Announcements, and Alarms.
    E. View This Week's Schedule – Used to show the current interactive Bell Schedule.
    F. Audio Distribution – Used for entire facility or Audio Zones
    G. Enable or Disable Audio – Used to place the Nyquist system into Page Exclusion mode (i.e., "mute" the system) when a contact closure is supplied from the fire alarm panel. Systems that do not provide this capability are deemed not equal.

        Systems that require application software to be installed on a PC to manage the above features shall not be considered equivalent.

6. To facilitate installation and configuration of the system, additional Web UI menus are required. The menus shall only be visible to users with the correct roles and CoS. The navigation menus found on the Web UI shall be as follows:

   A. System Parameters – Allow installers to adjust core system parameters.
   B. Zones – Allow installers to create and modify Paging, Time, and Audio Zones.
   C. Schedules – Allow installers and administrators to create bell schedules for the facility, predefine alternative schedules to run, prevent the bells from ringing on a holiday, and schedule an announcement to play. The system shall allow an unlimited number of schedules to operate simultaneously within a facility.
   D. Admin Groups – Allow the installer to create, modify, and delete software groupings of admin phones that can ring when a station calls in with a call switch.
   E. CoS Configuration – Allow the installer to create, modify, and delete CoS groups that control station access to the following features: Call-in Level, Zone Paging, All-Call Paging, Emergency All-Call, Inter-Facility Call/Page, Audio Distribution, Remote Pickup, Join Conversation, Call Forwarding, Walking Class of Service, External Call Routing, Call Transfer/3-way Calling, Manually Activate Tone Signals, Call Any Station, Manage Recording, Monitor Calls, Monitor Locations, Conference Admin, Conference User, Voicemail, Record Calls, Activate Alarm Signals, Disable Audio, Enable Audio, Allow Callee Auto-answer, District Paging, and Inter-Facility Features.
   F. Stations – Allow the installer to set up, modify, and delete stations; set up Page Exclusion; view Station Status; and add New Stations.
   G. Bridge Devices – Allow the installer to configure the Nyquist ASBs.
   H. Audio – Allow the installer to upload and manage Announcements, Playlists, Songs, and Tones. The system must support the uploading of both MP3 and WAV files and make Audio file management simple for users. Systems that limit the size of Audio files shall not be considered equal.
   I. Users – Allow the installer to manage users by giving them the proper roles and assign extensions if needed.
   J. Roles – Allow the installer to grant users rights to Create, Delete, Edit, Restart Server, Sort Menu, Systems Update, Manage, Import/Export, Restore, Settings, or View.
   K. Facilities – Allow the installer to set up the district wide facilities for remote paging and calling.
   L. Outside Lines – Allow the installer to set up FXS and FXO ports for inbound and outbound system calling.
   M. SIP Trunks – Allow the installer to set up SIP trunks into the facility for inbound or outbound calling.
   N. Call Details – Allow the installer to review the historical system activities that can be used for incident investigation or system troubleshooting.
   O. System Backup/Restore – Allow the installer to preform system backups or restores and allow the backups to be schedule to run automatically.
   P. System Logs – Allow the installer to view and export Server, Nyquist-Intercom, and Web Server logs that can be used for troubleshooting and technical assistance.
   Q. Paging Exclusions – Allow the installer to view and edit stations that are excluded from paging.
   R. Firmware – Update firmware for Nyquist speakers and appliances.
   S. Help – Provide information about the system, online help topics, and System Administrator Manual.
   .

   Systems that do not provide these menus as a minimum shall not be considered equal.

C. Nyquist NQ-E7030 Analog Station Bridge

   a. The Nyquist NQ-E7030 ASB allows facilities with existing Multicom or Quantum or compatible intercom systems to upgrade to Nyquist. Each ASB supports up to 24 speakers and call switches with 120 Watts of embedded 25 Volt power. The ASB is designed to drive any combination of 25 Volt speakers and horns. Features Include:

i. 10/100 Ethernet
ii. 24 station interface - Supports connections to as many as 24 individual 25 Volt speakers with one 25 Volt speaker connection per interface
iii. 24 dry contact closure-type analog Call Switch connections
iv. Half-duplex talkback using speaker as pickup
v. CAN Bus 2.0 Interface for future NQ-E7020 DCS support and other accessory devices
vi. 120W of available power across all 24 channels; maximum 40W per channel
vii. 2 x RGB full spectrum LED status indicators
viii. USB 2.0 host port, type A connector (future use)
ix. Universal mains supply (100VAC – 240VAC)

b. The Nyquist NQ-E7030 ASB shall be rack, wall, or shelf mountable and shall include the required mounting bracket hardware.

D. Nyquist NQ-P0100 Matrix Mixer Pre-Amplifier (MMPA)

1. The Nyquist NQ-P0100 MMPA is designed to bring external audio into the Nyquist system. The MMPA interfaces with a local sound system by accepting one or more local audio sources, mixing them, and outputting them to either, a) the network for Audio Distribution, or b) the MMPA's line level output that can then be inserted into an external amplifier to drive local sound system in gyms, cafeterias, auditoriums, etc. The MMPA supports the following:

a. Four software selectable MIC or Line Input channels via three XLR connectors and four sets of screw-terminals. Any single input channel shall be capable of being configured to support a Push-to-Talk microphone (for example, Bogen DDU-250). Channel-1 can be configured as a digital AES/EBU (AES3) input. Line/Monitor output – The MMPA becomes a station on the Nyquist system, allowing users to call it directly or to include it in any of the Page, Time, or Audio Zones.

b. The MMPA shall support the following features: Line-Level output to drive input on a local amplifier; One USB 2.0 host port (Type-A connector) for future use; 2 x RGB full spectrum LED status indicators.

c. The MMPA is powered by Universal mains supply (100VAC – 240VAC).

d. The MMPA shall be wall or shelf mountable and shall include the required mounting bracket hardware.

2. The dealer shall supply a minimum of one Nyquist MMPA that allows for up to four user-configurable audio inputs. The MMPA shall support Line, MIC, and digital AES/EBU (AES3) input sources. The system shall support an unlimited number of MMPAs.

E. Nyquist NQ-E7010 Input/Output Controller

a. The Nyquist NQ-E7010 I/O Controller is designed to accept contact closure inputs and activate open-collector outputs to drive relay coils.

a. PoE Class-1; IEEE 802.3af compliant with Optional 48VDC 15W power supply
b. Eight Dry Contact Closure Inputs that can be used with Fire Alarm Override Relays, external event triggers (for example, Lockdown Buttons, etc.)
c. Eight Relay Driver Outputs (Open-Collector) for use with Clock Correction (Sync Pulse), response to contact closure inputs, etc.
d. USB 2.0 host port, Type-A connector (future use)
e. 2 x RGB full spectrum LED status indicators

b. The Nyquist NQ-E7010 I/O Controller shall support wall or shelf-mounting options and shall include the required mounting bracket hardware.
c. The Nyquist NQ-E7010 I/O Controller shall be designed for wall or shelf mounting.

F. Nyquist VoIP Admin Phone – Color Touch Display (Admin Station)

1. The Nyquist Admin Station shall have the following features:

   a. 7” 800 x 480-pixel color display with backlight
   b. Touch screen display for one touch operation
   c. Full-duplex hands-free speakerphone with AEC
   d. Call hold, mute
   e. Redial, call return, auto answer
   f. PoE (802.3af) Class-3 support
   g. Headset with EHS support
   h. Dual Gigabit Ethernet ports
   i. Desk Mountable
   j. Optional Wall mount capable

2. The Nyquist Admin Station display panel shall show the time of day and day of week, the current bell schedule(s), and the station numbers and call-in priority of staff stations that are calling in. Depending upon the system programming, an Admin Station shall display menus to activate Zone Paging, All-Call Paging, Emergency All-Call Paging, District All-Call paging, alarm signals, and external functions.

3. The Admin Station shall be capable of calling either the loudspeaker or Staff Station at each classroom location.

   a. The Admin Station shall display the classroom number of any station that calls 911. This allows front-office administrators to direct emergency personnel to the correct physical location in the building when they arrive. If a system is not connected to outside phone lines, then 911 calls can be routed to a designated station within the facility. The system shall automatically record all 911 calls made from any station. The 911 call recording shall begin as soon as 911 is dialed and continue unit the call is terminated. Recorded calls shall be maintained on the system for later playback review and/or retrieval by authorized personnel and/or authorities. Systems that do not provide this feature will not be deemed equal.

G. Nyquist NQ-T1000 Staff VoIP Phone – LCD Display (Staff Station)

a. Nyquist Staff Station shall have the following features:

   a. 132 x 64-pixel graphical LCD with backlight
   b. Two-port 10/100M Ethernet Switch
   c. Full-duplex hands-free speakerphone with AEC
   d. Call hold, mute
   e. Redial, call return, auto answer
   f. PoE (802.3af) Class-3 support
   g. Dual-color (red or green) illuminated LEDs for line status information
   h. Two 10/100M Ethernet ports
   i. Wall or desk mountable

b. The classroom Staff Station shall be capable of the following features depending on how the station CoS is configured:

a. Emergency intercom call – Staff Stations shall be capable of making an Emergency intercom call, which is then routed to the assigned Admin Station. This requires the display of the architectural number and call in level on the Admin Station. Systems that do not provide this feature are not equivalent.
b. Speed dial
c. Toggle audio distribution on and off
d. Call Forward activation and deactivation for All-Calls/Busy/No Answer/Busy or No Answer
e. Conference Calling
f. Transfer Call
g. Dial Administrative station– Staff Stations can allow the user to dial the station number to call to the Admin phone or its associated speaker. The call shall be routed to the Admin Station showing the architectural number that is calling.
h. Emergency All-Call – An emergency page shall be broadcasted to all the stations in the facility.
i. Place Outside Call
j. Remote Answer
k. Single-Zone/All-Station Page
l. Call Waiting Tone for Outside Calls – It shall be possible to feed the call waiting tone to the Administrative Phone during a conversation.
m. Transfer call from VoIP speaker in classroom down to an associated Staff Station
n. Transfer call from analog speaker in classroom down to an associated Staff Station
o. Transfer call from VoIP Staff Station in classroom up to an associated VoIP speaker
p. Transfer call from Staff Station in classroom up to an associated analog speaker

H. Nyquist NQ-S1810CT VoIP Ceiling Speaker with Talkback and NQ-S1810WT VoIP Wall Baffle Speaker with Talkback

1. The VoIP speakers shall not require traditional intercom wiring or transformer taps to manually set or adjust volume. Simply connecting them via Cat 5 to a PoE Switch or PoE Injector on the system's network should allow them to be ready to program into the system. Volume is controlled via the Nyquist Web UI. All Nyquist audio appliances shall use a wideband Opus codec for Audio Distribution. Use of the Opus codec, along with G.722, allows for High Definition audio. Nyquist VoIP speakers shall be equipped with a digital MEMS microphone to achieve superior talkback audio. VoIP Speakers that utilize the speaker as the microphone shall not be considered equal.

2. The NQ-S1810WT VoIP Wall Baffle Speaker with Talkback design facilitates mounting the speaker up to four different ways:

    1. 2x2 Wall Mount
    2. Box Mount
    3. Corner Mount
    4. Tilted Mount

3. The VoIP Speakers provide CAN Bus 2.0 Interface support for the NQ-E7020 DCS.

4. The VoIP Speakers shall be PoE IEEE 802.3af compliant. VoIP speakers may be placed up to 100 meters (328 Feet) from a PoE switch or PoE Injector.

5. Software provides adjustable audio output level.

6. DHCP with Option 66 is supported for easy network deployment.

7. The VoIP Speakers provide VLAN support.

8. The VoIP Speakers are pre-assembled for faster installation.

9. Each VoIP Speaker includes a10 Watt integrated power amplifier.

10. Each VoIP Speaker has a digital MEMS microphone to support talkback.

I. Nyquist NQ-E7020 Digital Call Switch

1. The Nyquist DCS has been exclusively designed for use with Nyquist appliances equipped with a CAN Bus 2.0 Interface. The CAN Bus 2.0 interface provides power and signal, and multiple DCSs can connect to each CAN Bus 2.0 interface. The DCS fits into a Single Gang/ Low Voltage installation using standard ‘decora-plate’ covers (supplied).

2. The DCS is a capacitive touch button design, so it doesn’t have any moving parts to wear out. The behavior of this switch is software definable. Systems that require membrane or mechanical rocker style call switches that can wear out over time shall not be acceptable.

3. Normal call initiation involves touching the DCS one time. When a user touches the button on the DCS once, one of the three LED segments will light up green, a normal call will be placed, and the light will start blinking green. This is the indication that the Normal call has been placed to the VoIP Admin Phone or to a group of VoIP Admin Phones and that the phone or phones are ringing.

4. Urgent call initiation involves touching the DCS one time. When a user touches the button on the DCS once, one of the three LED segments will light up yellow, an Urgent call will be placed, and the light will start blinking yellow. This is the indication that the Urgent call has been placed to the VoIP Admin Phone or to a group of VoIP Admin Phones.

5. Emergency call initiation involves touching the DCS one or three times depending on station programming. When a user touches the button on the DCS once or three times within three seconds, all three LED segments will light up red, an Emergency call will be placed, and the light will start blinking red. This is the indication that the Emergency call has been placed to the VoIP Admin Phone or to a group of VoIP Admin Phones.

6. Single Press Emergency Call, if programmed, involves touching the DCS one time. When a user touches the button once, all three LED segments will light up red on the DCS, an Emergency call will be placed, and the light will start blinking red. This is the indication that the Emergency call has been placed to the VoIP Admin Phone or to a group of VoIP Admin Phones.

7. Normal and Urgent calls can easily be upgraded to an Emergency call after the DCS is flashing by touching the button on the DCS one time. The Normal or Urgent call will be canceled and an Emergency call will be placed.

8. Privacy Mode – Pressing and holding the button on the DCS for four seconds will place the speaker into Privacy Mode. As the user continually touches the DCS button, all LED segments will turn purple; when all three LED segments are lit purple, the speaker is in Privacy Mode. If a call comes into the classroom when the station is in Privacy Mode, the microphone will be disabled; the user in the classroom can touch the DCS once and it will allow talkback. Once the call ends, the classroom will need to manually return the speaker into Privacy Mode, if desired. The user can disable Privacy Mode without placing a call by pressing and holding the button on the DCS for four seconds. As the user continually touches the DCS, all LED segments will turn blue. When all three LED segments are lit blue, the speaker is no longer in Privacy Mode. Systems that require mechanical or membrane switches to achieve Privacy Mode shall not be considered equal.

9. The colors specified above are created by three RGB full spectrum LED segments to provide installers and users with visual status and feedback when installing and using the DCS. When the DCS is being installed and the power is connected before the signal, the LED will light red. It will also

light red if the speaker in the classroom stops communicating with the Nyquist Server, indicating a problem with the station.

10. In addition to providing visual call status indications, a call confirmation audio file shall be played on the associated loudspeaker when a call is placed via a DCS. The three call-in levels shall have distinct audio confirmation messages:

    a. Call Placed
    b. Urgent Call Placed
    c. Emergency Call Placed

11. Emergency Link Transfer – If an Emergency call is unanswered by the VoIP Admin Phone and the Emergency Link Transfer is active, the Emergency call will be forwarded to the loudspeaker associated with the Emergency Link Station. Any station equipped with a loudspeaker can be programmed as the Emergency Link Station. Systems that do not provide Emergency Link Transfer shall not be considered equal.

J. Bogen Analog Call Switch CA-15C

1. The momentary Call Switch shall be capable of placing a combination of Normal/Urgent/Emergency Calls based on the software configuration of the Call Switch.

2. Normal/Emergency call configuration: Making a Normal call in this mode involves pressing the button on the Call Switch once. A call is then placed to the designated Admin Station. An Emergency call involves pressing the call switch at least four times. The Emergency call is then routed to the designated Admin Station. In both scenarios, the calling station number and call-in level (Normal or Emergency) are displayed on the Admin Station or on a group of Admin Stations. Additionally, Emergency calls can be routed to an alternative Admin Station or Emergency Link.

3. Urgent/Emergency call configuration: Making an Urgent call in this mode involves pressing the button on the Call Switch once. A call is then placed to the designated Admin Station. An Emergency call involves pressing the button on the Call Switch at least four times. The Emergency call is then routed to the designated Admin Station. In both scenarios, the calling station number and call-in level (Urgent or Emergency) are displayed on the Admin Station or on a group of Admin Stations. Additionally, Emergency calls can be routed to an alternative Admin Station or Emergency Link.

A. Emergency Only call configuration: Making an Emergency call in this mode involves pressing the Emergency call switch with Call Level Emergency one time. The call is then switched to the Admin Station. This requires the display of the station number and call-in level on the Admin Station or on a group of Admin Stations. Additionally, Emergency calls can be routed to any Admin Station, including Emergency Link.

4. Emergency Link Transfer - If an Emergency call goes unanswered by the Admin Station and the Emergency link transfer is active, the Emergency call will be forwarded to the loudspeaker associated with the Emergency Link Station. Any station equipped with a loudspeaker can be programmed as the Emergency Link Transfer. Systems that do not provide Emergency Link Transfer shall not be considered equal.

5. In addition to the mechanical click of a Call Switch button press, a call confirmation audio file shall be played on the associated loudspeaker when a call is placed. The three call-in levels shall have distinct audio confirmation messages:

    a. Call Placed
    b. Urgent Call Placed
    c. Emergency Call Placed

K. Additional Loudspeakers for use with the Nyquist ASB

1. Classroom Speakers shall be Bogen:

    a. Ceiling Mounted Speakers: CSD2X2U Drop-In Ceiling Speaker
    b. Ceiling Mounted Speakers: S810T725PG8U Ceiling Speaker
    c. Wall Baffle Speakers: MB8TSQ/SL Metal Box Speaker

2. Hallway Speakers shall be Bogen or pre-approved equal.:

    a. Ceiling Mounted Speakers: CSD2X2U Drop-In Ceiling Speaker
    b. Ceiling Mounted Speakers: S810T725PG8U Ceiling Speaker
    c. Wall Baffle Speakers: MB8TSQ/SL Metal Box Speaker

3. Outdoor/Gym/Locker Room Speakers shall be Bogen or pre-approved equal.:

    a. FMH15T mounted in BBSM6 surface-mounted vandal-resistant enclosure/BBFM6 flush-mounted vandal-resistant enclosure with FMHAR8 adapter ring and SGHD8 heavy duty grille
    b. KFLDS30T Wide Dispersion Re-entrant Horn Loudspeakers

4. Common Area Speakers shall be Bogen or pre-approved equal:

    a. OCS1 Orbit Ceiling Speakers
    b. OPS1 Orbit Pendant Speakers

2.04 SYSTEM CAPABILITIES

A. The communication system shall be a Bogen Nyquist E7000 Series Educational System or pre-approved equal and shall provide a comprehensive communications network between administrative areas and staff locations throughout the facility.

The system shall provide no less than the following features and functions:

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1. Software-based, state-of-the-art, Voice over IP (VoIP) paging and intercom solution.

2. The system shall provide a Web User Interface (Web UI) shall allow users to configure and control the system, in accordance with their assigned User Role, from any Web browser enabled PC, Mac, Android or iOS tablet or mobile device.

3. Amplified-voice communication with analog loudspeakers shall use a shielded audio pair when connected to an ASB.

4. The system shall support any combination of the following VoIP phone station types: NQ-T1100 Administrative VoIP Phone – Color Touch Display (Admin Station) or NQ-T1000 Staff VoIP Phone – LCD Display (Staff Station).

    a. All VoIP phone station types shall utilize the same type of field wiring.

    b. There shall be no limit to the number of Admin Stations that can be connected to a facility. Systems that require different head-end equipment to make Admin Stations function, or systems that limit the number of Admin or Staff Stations shall not be deemed acceptable.

5. Future station alterations shall only require the Station Type to be changed in system programming. Alterations shall not require field wiring or system head-end alterations, unless an analog station device is being replaced by a VoIP station device or vice-versa.

6. The system shall be a global non-blocking system. The system shall be capable of unlimited amplified intercom paths per facility. Two amplified intercom paths shall be provided with each ASB for its complement of 24 stations. All hardware, etc., required to achieve the necessary number of amplified-voice intercom channels for this system shall be included in this submittal. ASB amplified-voice intercom channels shall provide voice-activated switching. Systems requiring the use of a push-to-talk

switch on administrative telephones shall not be acceptable. There shall be an automatic level control for return speech during amplified-voice communications. The intercom amplifier shall also provide control over the voice switching sensitivity and delay times of the VOX circuitry on the ASB.

7. The system shall provide 911 Dial-Through via outside FXO/FXS lines or SIP trunks to ensure that one or more lines are always available for 911 calls. The 911 Dial-Through is available to any properly configured station (via CoS). When a station dials 911, the 911 call is processed as follows:

    a. Call routes to an Emergency Group where the call can be answered.

    b. The 911 CO lines can be pre-configured and reserved. If the 911 reserved lines are busy, the normal CO lines will be connected to route the 911 calls. If all the normal CO lines are busy, then one of the ongoing calls shall be disconnected and the 911 call shall be placed.

    c. When 911 is dialed from any station, its designated Admin Station or Admin Group will receive a message that the station has dialed 911.

    d. The system shall automatically record all 911 calls made from any station. The 911 call recording shall begin as soon as 911 is dialed and shall continue until the call is terminated. Recorded calls shall be maintained on the system for later playback review and/or retrieval by authorized personnel and/or authorities.

8. It is of highest importance that Emergency calls from stations receive prompt attention. Therefore, it is important that there be an alternative destination in case the Emergency call does not get answered at the primary location. Details are as follows:

    a. Staff-generated Emergency calls shall be treated as the second highest system priority. Therefore, all Emergency calls shall annunciate at the top of the call queue of their respective Admin Station or Admin Group. Should that Emergency call go unanswered for 15 seconds, the call shall be re-routed to an alternative speaker station. Then, a tone will prompt the caller to make a verbal call for help and annunciates to the Emergency link station “Emergency.” During the transfer, the original administrative telephone shall continue to ring the distinctive Emergency Ring. Should the Emergency Transfer-to-Station have an associated Admin Station, it will also ring for the Emergency call.

    b. The Emergency Transfer-to-Station shall be software configurable.

    c. Systems failing to transfer unanswered Emergency calls or failing to immediately connect to the designated Admin Station shall not be deemed as equal.

9. There shall be a Facility Wide Emergency All-Call feature. The Emergency All-Call shall be accessed from designated Admin Stations or the Nyquist Dashboard or by the activation of an external contact closure that shall give a microphone input Emergency status. The Emergency All-Call function shall have the highest system priority and shall override all other loudspeaker-related functions including Time Tones, Normal All-Call or Zone Pages, or Audio Distribution.

    a. Considering that Emergency calls are to be treated with the highest level of concern, systems that do not regard Emergency All-Call with the highest priority shall not be deemed as equal.

    b. Upon touching the Directory icon, a menu shall appear on the Admin Station display prompting the user to select the desired menu.

    c. The Emergency All-Call shall capture the highest-level system priority and shall be transmitted over all speakers in the facility. It shall also be capable of activating an external control output, which can be used to activate external relays to automatically override volume controls, local sound systems, or strobe circuits.

d. Systems without Emergency All-Call or systems with All-Call that cannot be activated by external means or that do not capture complete system priority or activate an external relay, shall not be acceptable.

10. There shall be unlimited Alarm Tones (four by default). Each may be accessed by dialing *91 and the two-digit tone number from any Admin Station, SIP Trunk, or FXO/FXS system interface. These Alarm Tones are separate from the Time Tones. Users shall be able to add an unlimited number of Alarm Tones to the system by uploading MP3 or WAV files. Systems that do not Systems that do not allow the user to upload MP3 and WAV files to customize the Alarm Tones or need to use external alarm/tone generators or special software or have less than four Emergency Alarm Tones shall not be acceptable.

11. Upon touching the Directory icon on an Admin Station, a menu shall appear on the display prompting the user to select from the sub-menus. The Alarms sub-menu is the first available. This precludes the user from having to memorize complicated key sequences to access Alarm Tones.

12. There shall be unlimited I/O Controller relay driver outputs accessible and controllable by properly authorized users via an Administrative Web UI. These outputs remain set until accessed and reset. Users shall have the ability to review the status of each relay driver output. Users shall be prompted through fields via a plain English menu, precluding users from having to remember any dialing sequences to control this feature. The system shall support an unlimited number of I/O Controllers, and each I/O Controller shall be able to interact with any and all other I/O Controllers on the system (i.e., an input on one I/O Controller can trigger an output on one or more different I/O Controllers). Systems that require the user to remember complicated dialing schemes or prompt the user via cryptic commands shall not be acceptable.

    a. The I/O Controller can create a contact closure when the following operations are performed in the system:
        i. 911 call placed
        ii. Audio Distributed
        iii. Alarm is played
        iv. Announcement is played
        v. All-Call preformed
        vi. District All-Call performed
        vii. District-Emergency-All-Call
        viii. Emergency-Call
        ix. Emergency-All-Call
        x. Audio-Disabled
        xi. Page

13. The system shall provide software controlled and programmable control outputs for external relay activation for use with strobe lights, magnetic locks, card access systems, motion detectors, cameras, or any low-voltage, dry contact creating device. Systems using dedicated security stations for control of external functions shall not be acceptable.

14. The system shall be capable of interfacing to PSTN/PBX/iPBX via both FXO/FXS line and SIP trunk connectivity.

15. The system shall be capable of providing each facility (i.e., (i.e., Nyquist location) an unlimited number of incoming FXO/FXS or SIP trunk lines that can be designated by the user to ring the designated Day Admin or Night Admin. Where an Admin Station is designated to receive outside line calls, the incoming call's Caller ID information shall appear on the display. The system shall also provide the ability to make outside line calls from Admin Stations. This ability shall be programmable for each Admin Station and there shall be an unlimited number of CoSs available to assign to any station.

16. The system shall be capable of supporting DID, DISA, and Security DISA functions.

    a. The system shall provide a password-protected Security DISA feature that shall only be accessible from authorized Police, Fire, Emergency personnel, or an off-premise security office that monitors the facility's security system. The Security DISA feature shall function as follows: Upon dialing the Security DISA phone number, the caller will receive a dial tone from the system, after which he or she must enter the assigned Security DISA passcode on the dial pad. Upon confirmation, the system will present the dial tone again and will allow the authorized personnel to dial any station/classroom on the system and monitor the activity without any pre-announce tone or privacy beep. This will allow the authorized personnel to audibly assess the situation and determine what actions need to be taken.
    b. All DISA and Security DISA calls shall be automatically recorded by the system for later playback review and/or retrieval by authorized personnel and/or authorities.

17. The system shall provide for field-programmable three-, four-, five-, or six-digit architectural station numbers.

18. There shall be an automatic level control for return speech during amplified-voice communications.

19. Each station loudspeaker shall be assignable to all or any combination of Paging, Time, and/or Audio Zones. Systems that do not provide unlimited Paging, Time, and/or Audio Zones shall not be acceptable.

20. There shall be unlimited schedules with unlimited programmable events per facility. Each event shall sound one user-selected tone or external audio source. It shall be possible to assign each schedule to a day of the week or to manually change schedules from an authorized user via a web-based UI. Systems that do not provide unlimited schedules, events, and tones, or that require software to be installed on a PC to perform these functions shall not be acceptable.

    a. The system shall provide multiple concurrent schedules per facility/location to accommodate split facilities (for example., combined Elementary and Middle School, combined Middle and High School, etc.).

    b. The system must be capable of providing Class Change Music to be played from an external audio source or audio files that are stored in playlists on the system during class change periods or whenever a facility wants music to be played in an area (i.e., (i.e., one or more Time Zones) on an automated schedule.

    c. Each event shall be able to be directed to any one or more of the unlimited Time Zones.

    d. Each of the unlimited Time Zones shall have a programmable, customizable Preannounce Tone and volume control that is unique unto itself.

    e. Each event shall play any of the Normal tones or external audio. Each event may utilize a different tone. For example, the system shall be capable of sending the gymnasium, shop classes, and pool a separate, unique time tone to indicate "clean up." Minutes later, the entire facility can be sent a different time tone to indicate class change.

    f. Each of the unlimited Time Tones may be manually activated by selected VoIP Admin Phones or via an authorized user with access to the Web UI. These tones shall remain active as long as the telephone remains off-hook or until canceled from the keypad or the Nyquist Web UI.

        1. Systems that do not provide an unlimited number of schedules or do not provide automatic activation of schedules shall not be acceptable.

21. Internal Master Clock shall be included, allowing an unlimited number of events per facility. Systems that do not provide an internal master clock or that must supply an external master clock to meet these specifications shall not be acceptable.

22. The Nyquist E7000 is capable of synchronizing with an NTP server and automatically adjusting the Daylight Savings Time for any time zone in the world. The server that the Nyquist E7000 application is running on can also be used as an NTP server for other systems on the LAN (for example, IP Clocks and control systems).

23. There shall be a Zone Page/All-Call Page feature that is accessible by selected Admin Phones and FXO/FXS or SIP connection to the PSTN or PBX/iPBX.

24. There shall be an option to play a pre-announce tone at any loudspeaker selected for voice paging.

25. There shall be a voice-intercom feature that is accessible by CoS authorized staff phones, all Admin VoIP phones, and Admin Web UIs.

    a. There shall be a privacy beep played every 15 seconds at any selected loudspeaker to indicate that an intercom call is in progress.

    b. There shall be a pre-announce tone played at any selected loudspeaker for intercom call communication.

    c. For special applications, the privacy and pre-announce tone signals shall be capable of being disabled during system initialization.

    d. There shall be a switch over to private telephone communications should the person at the classroom loudspeaker pick up his or her Staff Station and dial *3 to transfer the call down to the associated classroom Staff Station.

26. There shall be various levels of telephonic communication accessible by all Admin Stations and Staff Stations.

    a. Staff Stations must be capable of being programmed to ring one Admin Station during day hours and a different Admin Station during night hours. Day and Night start hours shall be configurable. Staff Stations shall be capable of being assigned to any Admin station. Systems that limit the number and assignment of staff call-ins to an Admin Station shall not be acceptable.

27. Each VoIP speaker or ASB speaker equipped with a call switch (analog or digital) shall be configurable as one of three call-in types, as follows:

    a. Normal/Emergency
    b. Urgent/Emergency
    c. Emergency

27. Call buttons programmed for access Normal / Emergency or Urgent / Emergency shall be able to initiate an Emergency call by repeated flashing of the phone’s hook switch, or repeated pressing of the DCS or the Call Switch. Systems that require additional switches and/or conductors to initiate an Emergency call, shall not be acceptable.

28. Normal and Urgent calls shall be placed into the queue for the designated Admin Station or Admin Web UI.

29. Each Admin Station call queue shall first be sorted per call priority (for example, Emergency, then Urgent, and then Normal). Calls are sorted within each priority level on a first-in, first-out basis. When a call is answered, it shall automatically be removed from the queue. Systems that do not sort calls per priority and order received shall not be acceptable.

    a. The display shall simultaneously display a minimum of three intercom calls pending.

    b. Additional calls beyond three shall be indicated by a scrolling option on the right-hand side of the screen thus prompting the user that additional calls are waiting.

30. It shall be possible to answer any incoming call by picking up the handset while it is ringing. It shall not be necessary to press any buttons to answer a call unless the call has dropped into the queue.

31. Staff Stations

    a. Staff Stations shall receive a dial tone upon going off-hook. Outgoing calls are made by dialing the desired station. Incoming calls can be directed to the telephone or to the associated loudspeaker for a hands-free reply. There shall be a switchover from loudspeaker to private telephone communication when a person picks up the handset, dials *3, and presses Enter/OK.

    b. Staff Stations shall be programmable for any type of system access, provided by or restricted by the following CoS options:

        1. Call-in Level
        2. Zone Paging
        3. All-Call Paging
        4. Emergency All-Call
        5. Inter-Facility Call/Page
        6. Audio Distribution
        7. Remote Pickup
        8. Join Conversation
        9. Call Forwarding
        10. Walking Class of Service
        11. External Call Routing
        12. Call Transfer/3-way Calling
        13. Manually Activate Tone Signals
        14. Call Any Station
        15. Manage Recordings
        16. Monitor Calls
        17. Monitor Locations
        18. Conference Admin
        19. Conference User
        20. Voicemail
        21. Record Calls
        22. Activate Alarm Signals
        23. Disable Audio
        24. Enable Audio
        25. Allow Callee Auto-answer
        26. District Paging
        27. Inter-Facility Features
        28. Manage Output Contacts

    c. Staff Stations shall be able to make a Normal call to any Admin Station by dialing the Admin Station’s extension number. Staff Stations shall also be able to initiate an Emergency Call by dialing ****. Emergency Calls shall ring the Designated Day/Night Admin Station. The system

shall provide for each station to have a Personal Identification Number (PIN). By dialing the PIN at any system telephone, the administrator shall have access to Emergency paging regardless of the restrictions on the particular phone being used.

32. Admin Stations

a. Admin Stations shall receive a dial tone upon going off-hook. Outgoing calls are made by dialing the desired stations. Incoming calls can be directed to the telephone or to the associated loudspeaker for a hands-free reply. There shall be an automatic switchover from loudspeaker to private telephone communication should the person pick up his or her handset.

b. The display shall normally show the time of day and day of week, bell schedule name, and the numbers of a minimum of three stations calling-in, along with the call-in status of each station (Normal, Urgent, Emergency). The Admin Station's display shall indicate the station number being dialed from the Admin Station.

c. The display shall also provide user-friendly menu selections to assist the operator when using the Nyquist system. Displays shall be in English for maximum ease-of-use. Systems that require the operator to memorize long lists of operating symbols or control codes shall not be acceptable.

d. Admin Stations shall be programmable for any type of system access, providing or restricting the following CoS options:

1. Call-in Level
2. Zone Paging
3. All-Call Paging
4. Emergency All-Call
5. Inter-Facility Call/Page
6. Audio Distribution
7. Remote Pickup
8. Join Conversation
9. Call Forwarding
10. Walking Class of Service
11. External Call Routing
12. Call Transfer/3-way Calling
13. Manually Activate Tone Signals
14. Call Any Station
15. Manage Recordings
16. Monitor Calls
17. Monitor Locations
18. Conference Admin
19. Conference User
20. Voicemail
21. Record Calls
22. Activate Alarm Signals
23. Disable Audio
24. Enable Audio
25. Allow Callee Auto-answer
26. District Paging
27. Inter-Facility Features
28. Manage Output Contacts

e. Program selection and its distribution or cancellation shall be accomplished from a designated Admin Station with the assistance of the menu display system. Distribution and cancellation shall be to any one or combination of speakers, any Audio Zone or Audio Zones, or All Zones. It shall be possible to provide an unlimited number of program channels for the user to pick from.

f. It shall be possible via an Admin Station to manually initiate any of the unlimited Normal Tones or Emergency Tones. The Tones shall be separate and distinctly different from the Alarm Tones. The Tone selected shall be capable of being played one time, continuously until it is canceled, or until the administrative display phone is placed back on-hook.

g. Each Admin Station shall maintain a unique queue of all stations calling that Admin VoIP phone.

33. VoIP Wall Baffle and VoIP Ceiling Speakers shall be configurable as one of two station types: 1) VoIP Speaker Only, or 2) VoIP Speaker with DCS.

    a. The Bogen Nyquist VoIP speakers are powered via PoE. Use an 802.3af compliant PoE network switch port or PoE Injector to power these speakers. One PoE network switch port or PoE Injector is required per VoIP speaker.

    b. VoIP speakers can be equipped with a DCS that can be programmed as a Normal/Emergency, Urgent/Emergency, or Emergency Only and shall be able to initiate an Emergency call by touching the DCS one, two, or three times depending on the CoS and current call state of the DCS. If the station is authorized for Privacy Mode, the users can touch and hold for 4 seconds to enable Privacy Mode or hold for four seconds to disable Privacy Mode. Systems that require mechanical, membrane, or an additional number of switches to initiate an Emergency call, shall not be acceptable.

    c. Emergency Calls from VoIP Speaker with DCS shall have priority over the Normal and Urgent calls in the queue on the Admin Stations and will show up at the top of the list. Systems that do not provide priority for Emergency Call shall not be acceptable.

    d. Normal and Urgent calls shall be logged into queue for the designated Admin Stations.

        1. Admin Stations shall ring for when they receive a call, and then the call will be removed from the queue when the call is answered or when the Admin Queue times out (default is 30 minutes).

    e. Each queue call shall first be sorted by call priority (Emergency, then Urgent, and then Normal). Calls are sorted within each priority level on a first-in, first-out basis. When a call is answered, it shall automatically be removed from the queue. Systems that do not sort calls by priority and order received, shall not be acceptable. The display shall simultaneously show a minimum of three staff calls pending. Additional staff calls beyond three shall be indicated by an arrow pointing down thus prompting the Admin user that additional calls are waiting.

    f. It shall be possible to answer any incoming call simply by picking up the handset while it is ringing. It shall not be necessary to hit any buttons to answer a call unless the call has dropped into the queue.

34. System programming shall be from an authorized Nyquist Admin User via any web browser. A valid username and password shall be required to gain access to the following programmable functions:

    a. System Parameters – Allow installers to adjust core system parameters.
    b. Zones – Allow installers to create and modify Paging, Time, and Audio Zones.
    c. Schedules – Allow installers and administrators to create Bell Schedules for the facility, predefine alternative schedules to run. Holiday Events prevent the bells from ringing on a school holiday. The system shall allow an unlimited number of schedules to operate simultaneous within a facility.

d. Admin Groups – Allow the installer to create, modify, and delete software groupings of admin phones that can ring when a station calls in with a call switch.
e. CoS Configuration – Allow the installer to create, modify, and delete CoS groups that can have the following features defined: Call in Level, Zone Paging, All-Call Paging, Emergency All-Call, Inter-Facility Call/Page, Audio Distribution, Remote Pickup, Join Conversation, Call Forwarding, Walking Class of Service, External Call Routing, Call Transfer/3-way Calling, Manually Activate Tone Signals, Call any Station, Manage Recording, Monitor Calls, Monitor Locations, Conference Admin, Conference User, Voicemail, Record Calls, Activate Alarm Signals, Disable Audio, Enable Audio, Allow Callee Auto-answer, District Paging, and Inter-Facility Features.
f. Stations – Allow the installer to set up, modify, delete stations, set up Page Exclusion, view stations' status, and add a station.
g. Bridge Devices – Allow the installer to install the Nyquist ASBs.
h. Audio – Allow the installer to upload and manage Announcements, Playlists, Announcements, Songs, and Tones. The must support the uploading of both MP3 and WAV files making Audio file management simple for users. Systems that limit the size of Audio files shall not be considered equal.
i. Users – Allow the installer to manage users by giving them the proper Role and assign an Extension if needed.
j. Roles – Allow the installer to limit user to the following: create, delete, edit, restart server, sort menu, systems update, manage, import/export, restore, settings, or view.
k. Facilities – Allow the installer to set up the district wide facilities for remote paging and calling.
l. Outside Line – allow the installer to set up FXS and FXO ports for inbound and outbound system calling.
m. SIP Trunks – allow the installer to set up SIP trunks into the facility for inbound or outbound calling.
n. Call Details – allow the installer to review the historical system activities that can be used for incident investigation or system troubleshooting.
o. System Backup/Restore – allow the installer to preform system backup or restores and allow the backups to be schedule to run automatically.
p. System Logs – allow the installer to view and export Server, Nyquist-Intercom, and Web Server logs that can be used for trouble shooting and technical assistance.
q. Paging Exclusions – allow the installer to view and edit station that are excluded from paging.
r. Firmware – is used to update Nyquist appliances.
s. Help –Provides information about the system, online help topics, and System Administrator Manual.
t. Systems not capable of supporting web-based configuration and control, or require plugins or dedicated application software, shall not be deemed as equal.
u. Systems that require a Serial-to-Ethernet converter, or require additional application software on a PC for configuration and/or control shall not be deemed as equal.

35. Admin Group

a. Admin Stations can be placed into Admin Groups, which are used if incoming calls are not answered by the assigned Admin Station or the Day or Night Admin associated with the Admin Station. Admin Groups act as an always answer feature by providing an alternate list of Admin Stations. If an incoming call is not answered by the assigned Admin Station within 30 seconds for normal calls or 15 seconds for emergency calls, all Admin Stations in the Admin Group will ring.

b. If Call Forwarding is enabled at the Admin Station, Nyquist tries the forwarded extension. If that station does not answer or is busy, the call timeout is reduced to 15 seconds. After 15 seconds, the call rolls over to the Admin Group.

c. If an Emergency level call receives no answer, the Admin Group will ring if the Day Admin or Night Admin does not answer.

d. Admin Stations can be assigned to multiple Admin Groups. A Day or Night Admin can also be assigned to one or more Admin Groups.

36. Call Detail Reporting

    a. The Call Details feature allows the viewing and/or printing of detail records of every call in a facility in a call log format. Calls include scheduled announcements, paging, and internally and externally made or received telephone calls.

37. System Backup/Restore

    a. The system backup feature allows users with access to back up the system database, voicemail, and recordings.

    b. The system restore allows users with access to perform a system restore of previously backed up database, voicemail, and/or recordings.

    c. The installer also can set up an automatic backup that can be performed daily, weekly, or monthly.

38. System Log Files

    a. A log file records either events or messages that occur when software runs and is used when troubleshooting the system. The following parts of the Nyquist system generate log files:

        i. Server (This provides access to the Debian Linux OS server log files.)
        ii. Intercom (This provides access to the Intercom application server log files.)
        iii. Web Server (This provides access to the web server log files.)

    b. From the web-based UI, system logs can be viewed directly or exported via download to a PC, Mac, or Android device and then copied to removable media or attached to an email to technical support.

39. Paging Exclusions

    a. For school testing and exams, the administrators shall be able to put stations into Page Exclusion mode. During this time, the stations will only receive Emergency All-Call pages – not music, tones, or All-Calls. Emergency pages will still be heard at the station even if that station is set to exclude paging.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions, with the installer present, for compliance with requirements and other conditions affecting the performance of the Nyquist E7000 Series Educational System.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.02 EQUIPMENT MANUFACTURER'S REPRESENTATIVE

A. All work described herein to be done by the manufacturer's authorized representative shall be provided by a documented factory authorized representative of the basic line of equipment to be utilized.

B. As further qualification for bidding and participating in the work under this specification, the manufacturer's representative shall hold a valid C-10 Contractor's License issued by the Contractor's State License Board of [your state]. The manufacturer's representative shall have completed at least 10 projects of equal scope, giving satisfactory performance, and shall have been in the business of furnishing and installing sound systems of this type for at least five years. The manufacturer's representative shall be capable of being bonded to ensure the owner of performance and satisfactory service during the guarantee period.

C. The manufacturer's representative shall provide a letter with submittals from the manufacturer of all major equipment stating that the manufacturer's representative is an authorized distributor. This letter shall also state that the manufacturer guarantees service performance for the life of the equipment and that there will always be an authorized distributor assigned to service the area in which the system has been installed.

D. The contractor shall furnish a letter from the manufacturer of the equipment. This letter shall certify that the equipment has been installed according to factory intended practices, that all the components used in the system are compatible, and that all new portions of the systems are operating satisfactorily. Further, the contractor shall furnish a written unconditional guarantee, guaranteeing all parts and all labor for a period of five years after final acceptance of the project by the owner.

3.03 DIVISION OF WORK

A. While all work included under this specification is the complete responsibility of the contractor, the following division of actual work listed shall occur:

1. The conduit, outlets, terminal cabinets, etc., which form part of the rough-in work, shall be furnished and installed completely by the Division 26 Electrical contractor.

2. The balance of the system, including installation of speakers and equipment, making all connections, etc., shall be performed by the manufacturer's authorized representative. The entire responsibility of the system, its operation, function, testing and complete maintenance for one (1) year after final acceptance of the project by the owner, shall also be the responsibility of the manufacturer's authorized representative..

3.04 INSTALLATION

A. The installation, adjustment, testing, and final connection of all conduit, wiring, boxes, cabinets, etc., shall conform to local electrical requirements and shall be sized and installed in accordance with the manufacturer’s approved shop drawings.

B. Low-voltage wiring may be run exposed above ceiling areas where they are easily accessible.

C. The contractor shall install the new system at the location shown on the plans.

D. All Staff Stations and Call Switches shall be wall-mounted:

1. Mount at 54" AFF.
2. All wiring should be concealed.
3. Verify exact location with architect.
4. Avoid mounting near doors to prevent students from activating and running out of the rooms.

E. Admin Stations can be desk or wall mounted.

F. Speaker and telephone lines run above ceiling and not in conduit shall be tie-wrapped to a ceiling joist with a maximum spacing of 8' between supports. No wires shall be laid on top of ceiling tile.

G. Connect field cable to each Analog Speaker transformer using UL butt splices for #22 AWG wire.

H. Contractor shall provide a minimum of eight hours of configuration and operational instruction to school personnel.

1. Bogen Communications, Inc., shall provide online “How To” videos for instructing the teaching staff on how to operate the Teacher Dashboard aspect of the system.

I. On the first school day following installation of the Nyquist System, the contractor shall provide a technician to stand by and assist in system operation.

J. Mark and label all demarks IDF and MDF points with destination point numbers. Rooms with more than one outlet shall be marked XXX-1, XXX-2, XXX-3, etc. where XXX is the room number.

K. No graphic room number shall exceed the sequence from 000001 through 899999.

1. All outside speakers shall be on a separate Page Zone and Time Zone.
2. All zones shall be laid out not to exceed 40 Watts (@25V) maximum per zone.
3. All hallway speakers shall be tapped at 1 Watt (@25V) maximum.
4. All outside horns shall be tapped at 3.75 Watts (@25V) maximum.
5. All classroom speakers shall be tapped at ½ Watt (@25V) maximum.
6. Large rooms, such as cafeterias, shall be tapped at 2 Watts (@25V) maximum.

L. Plug disconnect: All major equipment components shall be fully pluggable by means of multi-pin receptacles and matching plugs to provide for ease of maintenance and service.

M. Protection of cables: Cables within terminal cabinets, equipment racks, etc., shall be grouped and bundled (harnessed) as to type and laced with No. 12 cord waxed linen lacing twine or T and B wire-ties, or hook and loop cable management. Edge protection material shall be installed on edges of holes, lips of ducts, or any other point where cables or harnesses cross a metallic edge.

N. Cable identification: Cable conductors shall be color-coded and individual cables shall be individually identified. Each cable identification shall have a unique number located approximately 1-1/2" from cable connection at both ends of cable. Numbers shall be approximately 1/4" in height. These unique numbers shall appear on the As-Built Drawings.

O. Shielding: Cable shielding shall be capable of being connected to common ground at point of lowest audio level and shall be free from ground at any other point. Cable shields shall be terminated in the same manner as conductors.

P. Provide complete “in service" instructions of system operation to school personnel. Assist in programming of telephone system.

3.03 GROUNDING

A. The contractor shall provide equipment grounding connections for Integrated Telecommunications/Time/Audio/Media System as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to ensure permanent and effective grounds.

B. The contractor shall provide ground equipment, conductor, and cable shields to eliminate shock hazard and to minimize the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments.

C. The contractor shall provide all necessary transient protection on the AC power feed and on all station lines leaving or entering the building.

D. The contractor shall note on their drawings the type and locations of these protection devices and all wiring information.

E. The contractor shall furnish and install a dedicated, isolated earth ground from the central equipment rack and bond to the incoming electrical service ground buss bar.

4.04 DOCUMENTATION

Provide the following directly to the Supervisor of Technology Services.

A. One printed copy of all field programming for all components in system

B. One copy of all diagnostic software with a copy of field programming data for each unit

C. One copy of all field wiring runs, location, and end designation of system

D. Provide one copy of all service manuals, parts list, and internal wiring diagrams of each component of system.

PART 4 - EXECUTION

END OF SECTION 27 51 13

SECTION 281300 – ACCESS CONTROL SYSTEM

A. GENERAL

1. SECTION INCLUDES

   a. Access control panel.
   b. Access control devices.
   c. Accessory devices.

2. RELATED SECTIONS

   a. Section 26 05 19 – Wires and Cables

3. REFERENCES

   a. NFPA 70 - National Electrical Code 2017.
   b. NFPA 72H - Guide for Test Procedures for Protective Signaling Systems.

4. SYSTEM DESCRIPTION

   a. Access Control System: Complete system that controls quantity of doors as shown on plans. System includes control panels, power supplies, card readers, and all accessories required for a complete system.

   b. The System shall be provided under an Allowance. Refer to the Architects Allowance Section 01 21 00.

   c. All conduit, outlet boxes and power shall be provided by the Division 26 Electrical contractor as part of the base bid.

5. SUBMITTALS

   a. Submit under provisions of Division 1.

   b. Shop Drawings: Indicate system wiring diagram showing each device and wiring connection required.

   c. Product Data: Provide electrical characteristics and connection requirements.

   d. Test Reports: Indicate satisfactory completion of required tests and inspections.

   e. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

   f. Protection Plan: Indicate doors with readers and device locations on floor plan for approval by Owner.

6. PROJECT RECORD DOCUMENTS

   a. Submit under provisions of Division 1.
   b. Record actual locations of all devices and path of wiring.

7. OPERATION AND MAINTENANCE DATA

   a. Submit under provisions of Division 1.

b. Operation Data: Operating instructions.
c. Maintenance Data: Maintenance and repair procedures.

8. QUALIFICATIONS

a. The system contractor shall be licensed in the State of North Carolina and who specializes in installation of Products specified in this section with minimum five years experience, and with service facilities within one hour of Project so as to provide prompt service. The Electrical Contractor shall connect to door hardware provided by the GC to ensure a fully functioning system. **The Electrical contractor shall provide all conduit, outlet boxes and power as part of his base bid.**

9. REGULATORY REQUIREMENTS

a. Conform to requirements of NFPA 70.

b. Furnish Products listed and classified by UL or other third party testing agency recognized by The State of North Carolina as suitable for purpose specified and indicated.

B. PRODUCTS

1. ACCESS CONTROL HARDWARE

a. Access control system. S2 Security Netbox Access Control System with up to 32 doors of access control. Provide additional S2 Netbox nodes where needed to accommodate any additional access controlled doors.

b. The system shall be fully integrated and connected to the Wake county S2 Global ACS system for centralized administration of card holder records.

c. Provide power supplies to match all electric hardware.

d. Provide HID multiclass mini-mullion contactless card readers P/N# S2900PTNNEK0060-S2SEC or approved equal.

e. All doors shall have REX (Motion or internal switch), Door contact Switch (flush mount or internal)

f. Wiring shall be in accordance with the manufacturer's recommendations and guidelines.

HARDWARE

a. Provided with doors by GC.

2. CONDUCTORS

a. 18/4 - 18/6 AWG as required by manufacturer, shielded, stranded, plenum type.

C. EXECUTION

1. INSTALLATION

a. Install in accordance with manufacturer's instructions.

b. The access control system shall be installed and programmed by security contractor, including the programming of all staff access cards. The programming format shall be obtained from the OCSS security shop. All staff information shall be obtained by the OCSS

project manager. The system shall be 100% complete, programmed and operable upon completion.

c. Prior to installation, final device locations shall be coordinated and approved by Owner.

d. All conductors shall be concealed to accessible ceiling void. Conductors installed above ceiling shall be tight to structure in bridle rings, J hooks or installed in cable trays. Control panel shall be wall mounted with all circuiting routed in concealed conduit(s) to accessible ceiling void, No exposed wiring will be accepted.

e. No splices in conductors shall be permitted at any point in system.

f. Coordinate installation of devices and connection to exit devices/strike plates with door hardware provider/owner

g. OCSS does not want door power supplies located above doors, unless otherwise accepted by the owner. Therefore, locate in closest MDF/IDF closets. Coordinate power location needed with electrical and door hardware contractors..

h. Provide Cat-6 plenum network cables for IP Video intercom system. Route from master and door stations back to nearest IDF/MDF

i. Coordinate with WCPSS prior to rough-in for any doors controlled thru the Ai-phone Master station. Add relays as required for door release control.

j. A pre-installation meeting shall occur prior to any rough-in for these systems.

2. FIELD QUALITY CONTROL

a. Field inspection and testing will be performed under provisions of Division 1.

b. Test in accordance with NFPA 72H.

3. MANUFACTURER'S FIELD SERVICES

a. Prepare and start systems under provisions of Division 1.

b. Include services of technician to supervise installation, adjustments, final connections, system testing, and Owner training.

END OF SECTION 281300

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DIVISION 28 13 00.1 – VIDEO-INTERCOM ACCESS CONTROL SYSTEM

A. GENERAL

B. Allowance: This section shall be provided under an allowance. **The Electrical Contractor shall provide all conduit, outlets, and power for this system as part of the base bid. Coordinate with owner / others for any rough-in**. Refer to Architects Allowance Section 01 21 00.

1. SECTION INCLUDES

    a. Video-Intercom Master Station
    b. Video-Intercom Door Station
    c. Accessory devices, relays, etc.

2. RELATED SECTIONS

    a. Section 26 05 19 – Wires and Cables

3. REFERENCES

    a. NFPA 70 - National Electrical Code 2017
    b. NFPA 72H - Guide for Test Procedures for Protective Signaling Systems

4. SYSTEM DESCRIPTION

    a. Video Intercom System: Provide and install a complete Video Intercom System with touch-screen monitor at the main receptions desk with the ability to unlock the main door through the access control system.

5. SUBMITTALS

    a. Submit under provisions of Division 1.

    b. Shop Drawings: Indicate system wiring diagram showing each device and wiring connection required.

    c. Product Data: Provide electrical characteristics and connection requirements.

    d. Test Reports: Indicate satisfactory completion of required tests and inspections.

    e. Manufacturer’s Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

6. PROJECT RECORD DOCUMENTS

    a. Submit under provisions of Division 1.
    b. Record actual locations of all devices and path of wiring.

7. OPERATION AND MAINTENANCE DATA

    a. Submit under provisions of Division 1.
    b. Operation Data: Operating instructions.
    c. Maintenance Data: Maintenance and repair procedures.

8. QUALIFICATIONS

    a. Electrical Contractor shall employ an alarm system subcontractor that is licensed in the State of North Carolina and who specializes in installation of Products specified in this section with minimum five years experience, and with service facilities within one hour of Project so as to provide prompt service. The Electrical Contractor shall connect to door hardware provided by the GC to ensure a fully functioning system.

9. REGULATORY REQUIREMENTS

    a. Conform to requirements of NFPA 70.

    b. Furnish Products listed and classified by UL or other third party testing agency recognized by The State of North Carolina as suitable for purpose specified and indicated.

C. PRODUCTS

1. CONDUCTORS

    a. 18/4 - 18/6 AWG as required by manufacturer, shielded, stranded, plenum type.

2. VIDEO INTERCOM SYSTEM

    1. Video Intercom – Aiphone JM Series or approved equal.

    2. Master Station – Aiphone JM-4MED or approved equal.

        - Removable SD Storage – minimum 32GB Scandisk or approved equal.

    3. Door Station – Aiphone JK-DV, DVF-HID or approved equal.

    4. Relay for door release.

    5. Wiring per manufacturer’s requirements.

D. EXECUTION

1. INSTALLATION

    a. Install in accordance with manufacturer’s instructions.

    b. Prior to installation, final device locations shall be coordinated and approved by Owner.

    c. All conductors shall be concealed to accessible ceiling void. Conductors installed above ceiling shall be tight to structure in bridle rings, J hooks or installed in cable trays.

    d. Control panel shall be mounted as directed by Onslow County security staff with all circuiting routed in concealed conduit(s) to accessible ceiling void, No exposed wiring will be accepted.

    e. No splices in conductors shall be permitted at any point in system.

    f. Coordinate installation of devices and inter connections to exit devices/strike plates with door hardware provider/owner. The front entry door B100A and B102A shall have capability to release from video-intercom master station.

    g. The Video Intercom System location shall be coordinated with owner/architect prior to rough-in. The system shall be 100% complete and operational at project completion.

h. A door release push button for door B102B shall be provided above the receptions B102 counter. Provide push button, relay and all 120V and low voltage wiring as needed. Coordinate closely with Owner.

2. FIELD QUALITY CONTROL

   a. Field inspection and testing will be performed under provisions of Division 1.

   b. Test in accordance with NFPA 72H.

3. MANUFACTURER'S FIELD SERVICES

   a. Prepare and start systems under provisions of Division 1.

   b. Include services of technician to supervise installation, adjustments, final connections, system testing, and Owner training.

END OF SECTION 28 13 00.1

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SECTION 28 16 00 – INTRUSION DETECTION SYSTEM

A. GENERAL

B. Allowance – All equipment for this system and its installation shall be part of the allowance. Refer to Architects Allowance Section 01 21 00. **The Electrical Contractor shall provide and Install all conduit, outlets that is needed for this system as part of the base bid. Coordinate all locations with owner / others.**

C. SECTION INCLUDES

a. Alarm control panel.
b. Intrusion detection devices.
c. Accessory devices.

1. RELATED SECTIONS

a. Section 26 05 19 – Wires and Cables

2. REFERENCES

a. NFPA 70 - National Electrical Code 2014.
b. NFPA 72H - Guide for Test Procedures for Protective Signaling Systems.

3. SYSTEM DESCRIPTION

a. Intrusion Detection System: Protect building and selected areas from intrusion during secure hours.

b. System shall be an integrated control/communicator for monitoring status of detection devices and communicating via telephone lines to multiple telephone numbers using two programmable reporting formats.

c. The School shall be partitioned into separate protected areas.

d. System capacity shall be such that every motion sensor is individually zoned and signal from fire alarm panel separately zoned.

4. SUBMITTALS

a. Submit under provisions of Division 1.

b. Shop Drawings: Indicate system wiring diagram showing each device and wiring connection required.

c. Product Data: Provide electrical characteristics and connection requirements.

d. Test Reports: Indicate satisfactory completion of required tests and inspections.

e. Manufacturers Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

f. Protection Plan: Indicate building protection areas and device locations on floor plan for approval by Owner.

5. PROJECT RECORD DOCUMENTS

a. Submit under provisions of Division 1.

b. Record actual locations of initiating devices, signaling appliances, and end-of-line devices.

c. The program and all zone information will be turned over to Onslow County security department.

6. OPERATION AND MAINTENANCE DATA

a. Submit under provisions of Division 1.
b. Operation Data: Operating instructions.
c. Maintenance Data: Maintenance and repair procedures.

7. QUALIFICATIONS

a. Electrical Contractor shall employ an alarm system subcontractor that is licensed in the State of North Carolina and who specializes in installation of Products specified in this section with minimum five years experience, and with service facilities within one hour of Project so as to provide prompt service.

8. REGULATORY REQUIREMENTS

a. Conform to requirements of NFPA 70.

b. Furnish Products listed and classified by UL or other third party testing agency recognized by The State of North Carolina as suitable for purpose specified and indicated.

D. PRODUCTS

1. INTRUSION DETECTION CONTROL PANEL

a. Eight EOL supervised, programmable zones, expandable to 255 zones with use of EZM multiplex modules of command center zones, for burglary, 2 or 4-wire fire, commercial fire or panic. NAPCO #GX255 or equal.

b. Netlink intranet/internet alarm reporting NAPCO #NL_MOD

c. Scheduling: 255 event schedule, programmable for 296 types of events.

d. Logs: 800 Event history log with real time clock, programmable log download, keypad recall of historic log, log sorting by O/C, system trouble, alarm or fire.

e. Codes: 195 individually reporting user codes with four programmable security levels each. Separate dealer, user program and download codes.

f. Modes: Diagnostics, flexible watch modes and 11 programmable areas/partitions with keypad management mode.

g. Secured bypass, two separate interior bypass and auto bypass options.

h. Auto arm, auto disarm and manual auto arm, with 2 separately programmable entry and exit delay times.

i. Outputs: 4 programmable relay outputs (one for pulse), armed output, low battery output, onboard supervised printer output.

j. Eight stages of lightening protection. Dual line telco cut detection. 24-hour protection programmable for all zones. Sensor watch, continuously monitors motion detectors for proper operation.

k. Communicator: Transmits in all major formats, including high speed modem formats, pager beeper compatibility, DPDT line seizure. Four telephone numbers with subscriber ID numbers assignable by area.

2. EXPANSION MODULE

a. 8 zone expander module with supervised zones and audible locator. NAPCO GEM-EZM8 or equal. Expansion module shall be by same manufacturer as control panel.

3. KEYPAD

a. Backlit 16 character LCD alphanumeric display keypad, with full sized touchtone keys that brighten when touched and built in four zone expansion module. NAPCO GEM-RP1CAe2 or equal. Keypad shall be by same manufacturer as control panel.

4. POWER SUPPLY

a. Power supply: Adequate to serve control panel modules and remote detectors, minimum 7 amp-hour rechargeable battery. Include battery-operated emergency power supply with capacity for operating system in standby mode for 24 hours.

5. INITIATING DEVICES

a. Passive Infrared Motion Detector:

1) Wide Angle - combination P.I.R. and DSC-BRAVO 600 or equal.
2) Long Range - GE #AP-633 or equal.

6. CONDUCTORS

a. Data cable - 20 awg, 2 pair UTP, West Penn #25242 (plenum rated).
b. Power cable —16 AWG 2 PR., stranded, West Penn #25225 (plenum rated).
c. Network cable: Cat-6 (plenum rated).

7. 911 HOLD-UP Button at main Reception counter:

a. USP HUB Hold-up button or functional equal.

E. EXECUTION

1. INSTALLATION

a. Install in accordance with manufacturer’s instructions.

b. Use cables as described in B, 7 above, with bridle rings every 10” to properly cabling.

c. Provide and install Cat-6 plenum cabling connection to owner’s network. Coordinate closely with owner’s Security and IT Departments.

d. Prior to installation, final device locations and zoning shall be submitted and approved by Owner.

e. All conductors shall be concealed in ¾” C to accessible ceiling void.

f. Control panel and keypads shall be wall mounted with all circuiting routed in concealed conduit(s) to accessible ceiling void. No exposed surface raceway will be acceptable.

g. Each device shall be individually zoned.

h. No splices in conductors shall be permitted at any point in system.

i. EZM modules shall not be mounted above ceiling. Mount EZM modules 5-0" off in a surface wall box (Mier Instruments or equal, 11" x 14" x 4") in mechanical/electrical rooms or Telco closets. Locate all EZM modules and power supplies on shop drawings for approval prior to installation.

j. Support all cables above accessible ceilings with "J" hooks or saddled bridle rings fastened to structure. Cables shall not share J-hooks with other system cables.

k. No exposed conductors permitted. Install nylon bushings in all conduits extended to ceiling void.

l. Contractor is responsible for programming the system and testing functionality. (Coordinate closely with Owner).

m. Provide lightning/surge suppressors for intrusion detection system.

n. Install a hold-up button under the receptions desk in the main office and wire as a dedicated zone to the main panel or nearest EZM.

o. The security system shall be interconnected with the Building Automation System. Contractor shall provide necessary relay as needed. Coordinate closely with HVAC controls contractor and Owner.

2. FIELD QUALITY CONTROL

a. Field inspection and testing will be performed under provisions of Division 1.
b. Test in accordance with NFPA 72H.

3. MANUFACTURERS FIELD SERVICES

a. Prepare and start systems under provisions of Division 1.

b. Include services of technician to supervise installation, adjustments, final connections, system testing, and Owner training.

END OF SECTION 28 16 00

SECTION 28 23 00 – CCTV SURVEILLANCE SYSTEM

A. GENERAL

B. Allowance – All components for this system which includes devices, licenses, cameras aiming, etc. shall be part of the allowance. Refer to Architect's Allowance section 01 21 00. **Electrical contractor shall provide and install all raceways, outlets as part of the base bid. The Camera system Cat-6 wiring shall be provided and installed by the structured wiring Division 27 contractor as part of the base bid.**

1. SECTION INCLUDES

   a. Device and cabling installation.

2. RELATED SECTIONS

   a. Section 26 05 33 – Raceway and Boxes for Electrical Systems
   b. Section 27 00 01 – Structured Wiring

3. REFERENCES

   a. NFPA 70 - National Electrical Code 2017.

4. SYSTEM DESCRIPTION

   a. Contractor shall provide cabling and patch panels and connectors, under provisions of Section 27 00 01, to all camera locations, as shown on the drawings.

   b. IP based camera system: Cameras, head end equipment, POE switches and final connections shall be provided and installed by the Owner.

5. PROJECT RECORD DOCUMENTS

   a. Submit under provisions of Division 1.

   b. Record actual locations of device boxes.

C. PRODUCTS - NOT USED.

D. EXECUTION

1. INSTALLATION

   a. Prior to installation, final device locations shall be submitted and approved by Owner.

   b. All conduit shall be concealed.

   c. Use gang box with single gang plaster ring for outlets.

   d. Device boxes shall be flush mounted with concealed conduit(s) to accessible ceiling void. No exposed surface raceway will be acceptable.

   e. Provide nylon bushing on all conduit stub-ups.

   f. Provide pull string in all empty conduits.

   g. Install CAT-6 plenum green cable and RJ45 jacks under provisions of Section 27 00 01 for each camera location. Extend cable to MDF/IDF as indicated on "E" drawings. Note: Provide 10' service

loop above ceiling at camera locations. Place colored dot on ceiling below coiled cable for Owner to locate.

h. At exterior camera locations, provide 10' service loop above lay-in ceiling on interior just inside adjacent to exterior outlet box. Provide SMP connector on label end of CAT-6 cable as directed by Owner.

i. All camera CAT-6 green plenum rated cables shall be terminated on separate patch panel in MDF/IDF data racks. Patch panel shall be labeled as directed by Onslow County Schools IT staff.

j. Note: All security camera work shall be coordinated with Onslow County Schools' security/IT staff prior to rough-in.

END OF SECTION 28 23 00

SECTION 28 31 12 – VOICE ANNUNCIATED ADDRESSABLE FIRE ALARM SYSTEM

A. GENERAL

1. RELATED DOCUMENTS

   a. Refer to Division 26 Specifications

   b. Architects Alternates Section 01 23 00 The Onslow County preferred Fire Alarm System is Notifier.

   c. This section covers Fire Alarm Systems, including initiating devices, notification appliances, controls and supervisory devices.

   d. Work covered by this section includes the furnishing of labor, equipment and materials for installation of the Fire Alarm System as indicated on the drawings/specification.

   e. The Fire Alarm System shall consist of all necessary hardware equipment and software programming to perform the following functions:

      - Fire Alarm and detection operations
      - Control and monitoring of elevators, door hold-open devices, smoke control equipment, fire suppression systems, and other equipment.
      - One way supervised automatic voice alarm operations.
      - Digitized custom messages for fire alarm or other messages as directed by owner. These messages shall be bi-lingual as defined by owner. Coordinate with owner prior to programming/customizing.

2. MINIMUM CODES AND STANDARDS

   a. The latest issue of specifications, standards and publications listed below form a part of this specification.

      1) 2013 NFPA 72 National Fire Alarm Code
      2) 2017 NFPA 70 National Electric Code (NEC)
      3) 2012 North Carolina State Building Code/Fire Prevention Code
      4) UL Testing Lab Compliance
      5) Local Codes and Standards
      6) ANSI A17.1
      7) North Carolina Accessibility Code (ADA)
      8) FM Compliance
      9) Other applicable NFPA Standards

3. QUALITY ASSURANCE

   a. Manufacturer’s Qualifications: Firms regularly engaged in manufacture of fire alarm systems of types, sizes, and electrical characteristics required, and whose products are Listed and Labeled. Products of firms that do not maintain factory authorized service organization and spare parts stock are not acceptable.

   b. Acceptable Manufacturers Only are: Notifier NFS with emergency voice/alarm communications or equals by Simplex or Siemens. Notifier is the owner’s preferred system manufacturer.

c. Company specializing in performing the work and making the final terminations and connections. Minimum of 5 years documented experience installing fire detection and alarm systems similar in size and scope to the project. Only the Installer may make program changes and must be present for the 100% test, Designer's pre-final review and Owner inspections.

d. All connections to the FACP and the system's programming shall be done only by the manufacturer, or by an authorized distributor that stocks a full complement of spare parts for the system. The technicians are required to be trained and individually certified by the manufacturer, for the FACP model/series being installed. This training and certification must have occurred within the most recent 24 months, except that a NICET Level III certification will extend this to 36 months. Copies of the certifications must be part of the Shop Drawing submittal to the Designers, prior to installation. The submittal cannot be approved without this information.

e. Any fire alarm device mounted outside shall be listed for the location and installed according to the listing.

4. SUBMITTALS:

a. Shop Submittals shall provide mA draw for each device submitted and the listed minimum voltage required to operate. Panel submittal shall list voltage drop allowed for panel and for individual NAC circuits.

b. Shop Drawings: (Documentation submitted per 2012 NCSBC Fire Prevention Code Section 907)

1) The fire alarm contractor shall submit complete Shop Drawings to the engineer for review, prior to performing any work. They shall clearly demonstrate compliance with the engineer's plans and specifications, which have a System Response Matrix showing the fire alarm system's actions (outputs) required for each type of alarm, supervisory, and trouble signal. Any non-compliant features must be fully described.

2) The submitted shop drawings shall show equipment, device identification numbers and locations, and connecting wiring of entire fire alarm system. Include wiring and riser diagrams. Wiring diagrams shall be based on the project floor plans, with devices and proposed conduit routing. The conductor composition for each conduit section shall be provided. The distance and route for each NAC (Notification Appliance Circuit) shall be shown. Riser diagrams shall show consecutive connections for all devices with addresses and Candela ratings.

3) Engineer's approval (with or without corrections) of contractor's Shop Drawings, samples, cut sheets, etc., is for general conformance with the contract documents and design concept. It shall not relieve the contractor of responsibility for full compliance with the project plans and specifications, EXCEPT for any specific non-compliant features for which the engineer gives written authorization.

c. Installation Instructions: The contractor shall submit to the engineer of record the Manufacturer's detailed installation instruction for the Fire Alarm Control Panel and all duct mounted smoke detectors, flow switches, tamper switches, supervisory switches, and similar items which require mechanical installation.

d. Battery Calculations:

1) This system shall provide a minimum of 24 hours battery power capacity, plus 15 minutes of full alarm load.

2) Include a copy of system battery sizing calculations with the shop drawing submittal to the engineer. Use manufacturer's battery discharge curve to determine expected battery voltage after 24 hours of providing standby power. Then use calculated Notification Appliance Circuit current draw in the alarm mode to determine expected voltage drop at End of the Line Resistor (EOL), based on conductor resistance per manufacturer's data sheet or NEC.

3) Fire Alarm Vendor's calculations must be submitted with the shop drawings, and prior to installation of equipment. (Buildings without generators typically require 24 hours of battery backup to cover the weekend, otherwise 24-hour battery back-up is required). In the submittal package identify Notification Appliance Circuits (NAC) current draws and voltage drops for each circuit. In no case shall the calculated voltage at any notification appliance fall below the minimum listed operating voltage for the devices used.

4) The voltage drop at EOL must not exceed 14% of the expected battery voltage, after the required standby time plus alarm time. (Typically, for a 24 volt system, this limits the voltage drop from the battery to the EOL to 3 volts). Determine "worst case" voltage at far end of each NAC, by subtracting its calculated V-drop from the expected battery voltage. The result must be no less than the minimum listed operating voltage for the alarm notification appliances used.

5) All of these calculations must be placed on a dedicated sheet of as-built drawings, for future reference by fire alarm service technicians. NAC voltage drop is to be verified during system tests.

e. Maintenance Data: The contractor shall submit maintenance data and parts lists for each type of fire alarm equipment installed, including furnished specialties and accessories. Include this data, product data, and shop drawings in maintenance manual.

f. Maintenance Contract: The contractor shall submit a quote for a maintenance contract to provide all maintenance, test, and repair described below and/or in accordance with NFPA-72, "Guide for Testing Protection Signaling Systems". Include also a quote for unscheduled maintenance/repair, including hourly rates for technicians trained on this equipment, and response travel costs. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty. Maintenance and testing shall be on a semiannual basis or as required whichever is the most restrictive. A preventive maintenance schedule shall be provided by the Contractor that shall describe the protocol for preventive maintenance. The schedule shall include:

1) Semiannual systematic examination, adjustment and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, relays, water flow switches and all accessories of the fire alarm system.

2) Semiannual testing of each circuit in the fire alarm system.

3) Semiannual testing of each smoke detector in accordance with the requirements of NFPA-72.

g. Certifications:

1) Submit a certification from the major equipment manufacturer indicating that the proposed supervisor of installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses, and telephone numbers in the certification.

2) Installer's training certificate as defined under Quality Assurance.

B. PRODUCTS

1. FIRE ALARM CONTROL PANEL (FACP)

a. FACP - General: The FACP shall meet the following general requirements (unless otherwise required by the owner for certain systems):

1) The system is to be the addressable type, with a 24vdc nominal operating voltage.

2) The system is to have multiple access levels so owner's authorized personnel can disable individual alarm inputs or normal system responses (outputs) for alarms, without changing the system's executive programming or affecting operation of the rest of the system. The process on how to do this must be included in the training required to be given to the owner's designated personnel, this must also be part of the written documentation provided by the fire alarm equipment supplier.

3) Signal Line Circuits: (SLC) also called addressable loop - Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded onto an NFPA Style 6 (Class A) Signaling Line Circuit (SLC) with no "T" taps.

4) Initiation Device Circuits: Initiation Device Circuits (IDC) shall be wired Class A (NFPA 72 Style D).

5) Notification Appliance Circuits: Notification appliance circuits shall be wired Class B (NFPA 72 Style Y).

6) Digitized electronic signals shall employ check digits or multiple polling. In general a single ground or open on any system signaling line circuit, initiating device circuit, or notification appliance circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.

7) Loss of Power: Alarm signals arriving at the main FACP shall not be lost following a power failure (or outage) until the alarm signal is processed and recorded.

8) The FACP must have an Alarm Silence switch, equipped with the Subsequent Alarm (alarm resound) feature. Any remote annunciators or graphic displays located away from the alarm area must also include an audible signal with alarm resound feature.

9) Emergency Voice/Alarm Communications shall provide:

- Alarm/Evacuation Signal Generation with multiple built-in tones.
- Manual/Automatic operation.
- Mass notification operation.
- Standard or customized digital message storage generation (minimum 16 messages), bi-lingual as indicated by owner.

b. System Response to an Alarm Condition: When a fire alarm condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:

1) The system alarm LED shall flash.

2) A local piezo-electric signal in the control panel shall sound.

3) An 80-character minimum LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.

4) On systems equipped with a printer, printing and history storage equipment shall log the information associated with each new fire alarm control panel condition, along with time and date of occurrence.

5) All system output programs assigned via control-by-event equations to be activated by the particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated. Exact programming shall be provided by the Contractor to meet the Owner's requirements.

6) Activate all fire alarm Notification Appliances in the building, sounding and flashing in synchronization continuously until the initiating device and control unit have been reset to normal condition.

7) Activate digital alarm communicator.

8) Deactivate door hold control relay such that all smoke doors are allowed to close.

9) Deactivate control relays so that HVAC units shut down. Exception is for hazardous exhaust systems and smoke control.

10) Activate elevator recall sequence if smoke is detected in any elevator lobby, shaft, or in the elevator equipment room.

c. System Response to a Trouble Condition:

1) Systems AC power trouble signal shall not be sent unless maintained for 1 to 3 hours (or more) Provide additional relays as required for this purpose.

2) Provide immediate transmission of all other supervising signals. Note: Any trouble signal transmitted to the FACP shall be delayed for 60 seconds.

3) Provide adjustable time delay for all other trouble signals prior to transmission.

4) FACP: The FACP shall contain a microprocessor based Central Processing Unit (CPU). The CPU and its associated equipment shall be protected so it can not be affected by voltage surges or line transients consistent with UL standard 864. The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent detectors, addressable modules, local and remote operator terminals, printers, annunciators, and other system controlled devices. The main FACP shall perform the following functions:

5) Supervise and monitor all intelligent addressable detectors and monitor modules connected to the system for normal, trouble and alarm conditions.

6) Supervise all initiating, signaling, and notification circuits throughout the facility by way of connection to monitor and control modules.

7) Detect the activation of any initiating device and the location of the alarm condition. Operate all notification appliances and auxiliary devices as programmed.

8) Visually and audibly annunciate any trouble, supervisory or alarm condition on operator's terminals, panel display, and annunciators.

d. System Capacity and General Operation: The system shall have the following capacities and general operation modes:

1) The FACP shall provide for a minimum of 198 intelligent/addressable devices per Signaling Line Circuits (SLC) and 2000 annunciation points, minimum, per system. The number of SLCs provided shall be as indicated on the Drawings. Total points shall be as indicated on the drawings or otherwise specified.

2) The FACP shall include a full featured operator interface control and annunciation panel that shall include a backlit, 80 minimum character liquid crystal display, individual, color coded system status LEDs, and an alphanumeric keypad for the field programming and control of the fire alarm system.

3) All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the fire alarm control panel.

e. The FACP shall be able to provide the following features:

1) Upload/Download to PC Computer
2) Charger Rate Control
3) Drift Compensation
4) Automatic Day/Night Sensitivity Adjust
5) Device Blink Control
6) Pre-alarm Control Panel Indication
7) Trouble Reminder
8) NFPA 72 Smoke Detector Sensitivity Test
9) System Status Reports
10) Periodic Detector Test
11) Alarm Verification, by device, with tally
12) Non-Alarm Module Reporting
13) Block Acknowledge
14) Smoke Detector Maintenance Alert
15) Control-By-Time

f. The control panel shall be capable of printing historical data and device parameters and shall include all equipment necessary to produce printouts, including an external printer and shall be U.L. listed as meeting the NFPA 72 sensitivity testing and maintenance requirements without the need for manually removing and testing each smoke detector. The control panel shall provide a display and a printed list of these sensitivity measurements as a permanent record of the required sensitivity testing. The system shall also annunciate a trouble condition when any smoke detector approaches 80% of its alarm threshold due to gradual contamination, with an annunciation of the location of the smoke detector requiring service. If any specialized equipment must be used to program any function of the smoke detector devices, then one must be furnished as part of the system.

g. The system shall perform time based control functions including automatic changes of specified smoke detector sensitivity settings.

h. Central Processing Unit: The Central Processing Unit (CPU) shall communicate with, monitor, and control all other modules within the control panel. Removal, disconnection or failure of any control panel module shall be detected and reported to the system display by the CPU.

1) The CPU shall contain and execute all control-by-event (including ANDing, ORing, NOTing, CROSSZONEing) programs for specific action to be taken if an alarm condition is detected by the system. Such control-by-event programs shall be held in non-volatile

programmable memory, and shall not be lost with system primary and secondary power failure. The CPU shall also provide a real-time clock for time annotation of all system displays. The Time-of-Day and date shall not be lost if system primary and secondary power supplies fail.

2) The CPU shall be capable of being programmed on site without requiring the use of any external programming equipment. Systems that require the use of external programmers or change of EPROMs are not acceptable.

i. Operators Control: Provide an operator interface which allows the following minimum functions. In addition, the operator interface shall support any other functions required for system control and/or operation:

1) Acknowledge (ACK/STEP) Switch
2) Signal Silence Switch
3) System Reset Switch
4) System Test Switch
5) Lamp Test Switch

j. Display: The system display shall provide all the controls and indicators used by the system operator and may also be used to program all system operational parameters. The display assembly shall contain, and display as required, custom alphanumeric labels for all intelligent detectors, addressable modules, and software zones.

1) The system display shall provide an 80 minimum-character back-lit alphanumeric Liquid Crystal Display (LCD).

2) The Display shall also provide four Light-Emitting-Diodes (LEDS), that will indicate the status of the following system parameters: AC POWER, SYSTEM ALARM, SYSTEM TROUBLE, and SIGNAL SILENCE.

3) The system display shall provide a touch key-pad with control capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels shall be accessible through the display interface assembly to prevent unauthorized system control or programming.

k. Signaling Line Circuit (SLC) Interface Board: The FACP shall contain SLC interface boards as required to communicate with the SLC. Each SLC board shall monitor and control a minimum of 198 intelligent addressable devices. This includes 99 analog detectors (Ionization, Photoelectric, or Thermal) and 99 monitor or control modules.

1) Each SLC interface board shall contain its own microprocessor and shall be capable of operating in a local mode (any SLC input activates all or specific SLC outputs) in the event of a failure in the main CPU of the control panel. The SLC interface board shall not require any jumper cuts or address switch settings to initialize SLC Loop operations. SLC interface boards shall provide power and communicate with all intelligent addressable detectors and modules connected to its SLC Loop on a single pair of wires. This SLC Loop shall be capable of operation as NFPA 72 Style 6.

2) Each SLC interface board shall receive analog information from all intelligent detectors and shall process this information to determine whether normal, alarm, or trouble conditions exist for that particular detector. The SLC interface board software shall include software to automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information may also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.

l. Printer: Provide a printer to provide hard-copy printout of all changes in status of the system. The printer shall time-stamp such printouts with the current time-of-day and date. The printer shall be standard carriage with 80-characters per line and shall use standard pin-feed paper. Thermal printers are not acceptable. The printer shall operate from a 120 VAC, 60 Hz power source. Provide table and stand for printer if it is to remain constantly connected to the fire alarm panel.

m. Remote Transmissions: The FACP shall be interfaced to a Digital Alarm Communications Transmitter (DACT).

n. Power Supply: The FACP power supplies shall operate on 120 VAC, 60 Hz and shall have a continuous rating adequate to power all equipment and functions in full alarm continuously. All modules and drivers must be able to withstand prolonged short circuits in the field wiring, either line-to-line or line-to-ground, without damage. Further, the power supply shall be expandable for additional notification appliance power in 3.0 Ampere increments.

o. The power supply shall provide a battery charger using dual-rate charging techniques for fast battery recharge.

p. Batteries: Shall be completely maintenance free, shall not require liquids, fluid level checks or refilling, and shall not be capable of producing spills and/or leaks. Batteries shall be sealed gel-cell type with expected life of 10 years. Battery voltage shall be as required by the FACP and related equipment. Battery shall have sufficient capacity to power the fire alarm system for not less than 24 hours plus 15 minutes of alarm upon a normal AC power failure. NAC circuits shall not exceed 75% of maximum current load allowed. (For batteries serving emergency voice communications the duration of alarm reserve shall be 15 minutes in lieu of 5 minutes)

q. Enclosures: The FACP shall be housed in a 3rd party listed cabinet suitable for surface or semi-flush mounting. Cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators. For convenience, the door may be hinged on either the right or left side (field selectable).

2. ALARM APPLIANCES

a. Strobe Lights shall be located as shown on the Drawings and provided per the requirements of the NCSBC chapter #11 and ICC A117.1-2009. Strobe lights indicated for use exterior to the building shall be mounted at the indicated elevation and listed for use in wet locations. Strobe lights shall operate with synchronized flash output and have the following specifications:

1) Voltage: Strobe lights shall operate on 24 VDC nominal.

2) Maximum pulse duration: 2/10ths of one second.

3) Strobe intensity and flash rate: Must meet minimum requirements of UL 1971. Provide strobe lights with minimum intensity Candela (Cd) rating of 15/110 Cd, or greater if shown otherwise on drawings.

b. Speakers:

- Ceiling speakers: 8" round, field selectable taps 1/8 to 8 watts, dual voltage 25/70 VRMS
- Ceiling speaker/strobes: 8" round, field selectable taps 1/8 to 8 watts, dual voltage 25/70 VRMS, field selectable candella settings 15-177 CD
- Cluster speakers/strobe: equal to Cooper Wheelock Series STH or equal.

- Wall Mounted Speakers: Dual voltage 25/70 VRMS, selectable taps 1/8 to 8 watts, frequency response 400-4000Hz and low current design, when used in exterior application provide as weatherproof.

- Wall Mounted Speakers-Strobes Dual voltage 25/70 VRMS, selectable taps 1/8 to 8 watts, frequency response 400-4000Hz, low current design, (1) flash per second rate over regulated voltage range. The strobe shall be of multi-candela design having field selectable settings 15CD-110CD.

- Speakers shall be tapped to meet intelligibility criteria meeting average DB requirements of 15DB above ambient for each space. The adjustments shall also meet the Acoustically Distinguished Space (ADS) measurement STI/CIS range (good-excellent).

c. Bells shall be 10” diameter vibrating type located as shown on the Drawings; bells located outdoors shall be listed for use in wet locations. Bells shall have the following specifications:

Voltage: Bells shall operate on 24 VDC normal.

(COORDINATE WITH FIRE-PROTECTION CONTRACTOR.)

3. INITIATING DEVICES

a. Addressable Devices - General: All initiating devices shall be individually addressable. Addressable devices shall comply with the following requirements:

1) All addressable spot type and duct smoke detectors shall be the analog type and the alarm system shall automatically compensate for detector sensitivity changes due to ambient conditions and dust build-up within detectors. This feature must be armed and sensitivities set prior to acceptance of the system.

2) Address Setting: Addressable devices shall provide an address-setting means.

3) Connections: Addressable devices shall be connected to a Signaling Line Circuit (SLC) with two (2) wires.

4) Operational Indications: Addressable initiation devices shall provide dual alarm and power LEDs. Both LEDs shall flash under normal conditions, indicating that the device is operational and in regular communication with the control panel. Both LEDs shall be placed into steady illumination by the FACP to indicate that an alarm condition has been detected. The flashing mode operation of the detector LEDs shall be optional through the system field program. An output connection shall also be provided in the device base to connect an external remote alarm LED.

5) Intelligent Initiation Devices: All smoke detectors shall be the “intelligent” in that smoke detector sensitivity shall be set through the FACP and shall be adjustable in the field through the field programming of the system. Sensitivity shall be capable of being automatically adjusted by the FACP on a time-of-day basis. Using software in the FACP, detectors shall be capable of automatically compensating for dust accumulation and other slow environmental changes that may affect performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72.

6) Spot-type detectors must be the plug-in type, with a separate base (not a mounting ring), to facilitate their replacement and maintenance. The base shall have integral terminal strips for circuit connections, rather than wire pigtails. Each detector or detector base shall incorporate an LED to indicate alarm.

7) Device mounting Base: Unless otherwise specified all detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature.

8) Sounder Base: Provide bases with a built-in (local) sounder rated at 85 dBA minimum, measured at 10 ft. Configure sounder bases such that sounders are activated under conditions as described in the Matrix.

9) Test Means: The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel when in the “test” condition.

10) Device Identification: Detectors shall store an internal identifying type code that the control panel shall use to identify the type of device. Device identifications shall be either ION, PHOTO, or THERMAL.

b. Photoelectric Smoke Detectors: Photoelectric smoke detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.

c. Ionization Smoke Detector: Ionization smoke detectors shall use the dual-chamber ionization principal to measure products of combustion and shall, on command from the control panel, send data to the panel representing the analog level of products of combustion.

d. Thermal Detectors: Thermal Detectors shall be intelligent addressable devices rated at 135°F (58°C) and shall have a rate-of-rise element rated at 15° F. (9.4°C) per minute. It shall connect via two wires to the Fire Alarm Control Panel Signaling Line Circuit. Up to 99 intelligent heat detectors may connect to one SLC loop. Thermal detectors shall use an electronic sensor to measure thermal conditions caused by a fire and shall, on command from the control panel, send data to the panel representing the analog level of such thermal measurements.

e. Duct Smoke Detector: In-Duct Smoke Detector Housings shall accommodate a velocity rated photoelectric detector. The device, independent of the type used, shall provide continuous analog monitoring and alarm verification from the panel. When sufficient smoke is sensed, an alarm signal shall be initiated at the FACP. Proper installation and physical location of each duct detector and access door shall be coordinated between the electrical, the mechanical and the fire alarm sub-contractors and approved by the electrical and mechanical engineers prior to equipment installation.

f. Addressable Pull Stations - General: Addressable pull stations shall, on command from the Control Panel, send data to the panel representing the state of the manual switch. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key. All pull stations shall be dual-action, have a positive, visual indication of operation and utilize a key type reset. The Glass-break rods are not allowed.

4. MISCELLANEOUS SYSTEM ITEMS

a. Addressable Dry Contact Monitor Module: Addressable Monitor Modules shall be provided to connect one supervised zone (either Style D or Style B) of non-addressable Alarm Initiating Devices (any Normally Open [N.O.] dry contact device) to one of the Fire Alarm Control Panel Signaling Line Circuit Loops. Monitor modules shall be installed as required by the system configuration. All required monitor modules may not be shown on the Drawings.

1) Indication of Operation: An LED shall be provided that shall flash under normal conditions, indicating that the Monitor Module is operational and in regular communication with the control panel.

2) Supervision: Unless specifically noted otherwise on the drawings provide one monitor module for each sprinkler switch.

b. Two Wire Detector Monitor Module: Addressable Monitor Modules shall be provided to connect one supervised IDC zone, Class A of non- addressable 2- wire smoke detectors or alarm initiating devices (any N.O. dry contact device) to one of the Fire Alarm Control Panel Signaling Line Circuit Loops. Monitor modules shall be installed as required by the system configuration. All required monitor modules may not be shown on the Drawings. Indication of Operation: Unless otherwise indicated on the Drawings an LED shall be provided that shall flash under normal conditions, indicating that the Monitor Module is operational and in regular communication with the control panel.

c. Addressable Control Module: Addressable Control Modules shall be provided to supervise and control the operation of one conventional Notification Appliance Circuit (NAC) of compatible, 24 VDC powered, polarized Audio/Visual (A/V) Notification Appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contract relay. The control module shall provide address-setting means using DIP switches and shall also store an internal identifying code that the control panel shall use to identify the type of device. An LED shall be provided that shall flash under normal conditions, indicating that the control module is operational and is in regular communication with the control panel.

1) Configuration: The control module NAC circuit may be wired for Style Y with up to 1 Amp of inductive A/V signal, or 2 Amps of resistive A/V signal operation, or as a dry contact (Form C) relay. The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.

2) Power Source: Audio/visual power shall be provided by a separate supervised power loop from the main fire alarm control panel or from a supervised, 3rd party listed remote power supply. AN power sources and connections are not shown on the Drawings

3) Test Switch: A magnetic test switch shall be provided to test the module without opening or shorting its NAC wiring.

d. Isolator Module: Isolator Modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC loop. The Isolator Module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC Loop. Modules must be readily accessible (not above ceiling) and clearly labeled.

1) Operation: Isolator Modules shall operate such that if a wire-to-wire short occurs, the Isolator module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected, the Isolator Module shall automatically reconnect the isolated section. The Isolator Module shall not require any address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an Isolator Module after its normal operation.

2) The Isolator Modules shall provide a single LED that shall flash to indicate that the Isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

e. Water Flow Switch: Flow switches shall be integral, mechanical, non-coded, non-accumulative retard type. Flow switches shall have an alarm transmission delay time that is conveniently adjustable from 0 to 60 seconds. Initial settings shall be 30-45 seconds. Flow switches shall be located a minimum of one (1) foot from a fitting that changes the direction of the flow and a minimum of three (3) feet from a valve as required per NFPA 13. Installation:

Water Flow Switches shall be connected by the Division 26 (Electrical) Contractor but furnished and installed by the Division 23 (Mechanical) Contractor.

f. Sprinkler and Standpipe Valve Supervisorv Switch: Supervisory switch mechanisms shall be contained in a weatherproof housing that shall provide a 3/4 inch tapped conduit entrance and shall incorporate the necessary facilities for attachment to the valves. Switch housing shall be finished in red baked enamel. Mounting: Mount switch so as not to interfere with the normal operation of the valve and adjust to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one-fifth of the distance from its normal position.

g. Serially Connected Remote Annunciator: Annunciator shall communicate with the fire alarm control panel via an EIA-485 communications loop (four-wire) and shall individually annunciate all zones in the system. System zones shall be as indicated on the Drawings. Up to 10 annunciators may be connected to the EIA-485 communications loop.

1) Annunciator Indicators: The annunciator shall provide a red Alarm LED per zone, and a yellow Trouble LED per zone. The annunciator shall also have an “ON-LINE” LED, local piezo sounder, local acknowledge/lamp test switch, and custom zone/function identification labels. Annunciator switches may be used for System control such as, Global Acknowledge, Global Signal Silence, and Global System Reset. All annunciator switches and indicators shall be software programmable.

2) LCD Alphanumeric Display Annunciator: The Alphanumeric Display Annunciator shall be a supervised, remotely located back-lit LCD display containing a minimum of eighty (80) characters for alarm annunciation in clear English text. The LCD Annunciator shall display all alarms and trouble conditions in the system.

3) System Capacity: The system shall allow a minimum of four LCD annunciators. In addition to annunciation functions, each LCD annunciator shall be capable of the following software programmed system functions: Acknowledge, Signal Silence and Reset.

4) Connections: The annunciator shall connect to a two-wire EIA-485 interface. The two-wire connection shall be capable operation at distances of 6,000 feet. Provide interface to fiber optic cable systems and/or repeater units where such are indicated on the Drawings.

h. Remote Annunciator Indicator Lights (RAIL): RAILs shall be provided with a key type switch for testing of the annunciated device. In addition, RAILs shall have the following features: Voltage: RAILs shall operate on 24 VDC nominal.

i. Door Hold-Open Magnets: Door hold open magnets shall be suitable for mounting in a single gang electrical device box. Door hold open magnets shall be furnished with keepers, door chains, and other accessories as required to properly hold open doors as indicated on the Drawings. Holding force of the magnet shall be appropriate for the door to be held open. Door hold open magnets shall operate in a fail safe manner, i.e., the door shall release in event of a failure of voltage to the device. Power Source: Door hold open magnets shall be configured to operate from a nominal 24 VDC system as supplied by the FACP or other power supply listed for the purpose. All hold open magnet supply sources, whether a part of the FACP or whether derived from a separate power supply, shall be supervised. Door hold open magnet circuits which use step-down transformers, 120 VAC, or local relays are not permitted. Door shall close after 60 seconds of the power loss.

j. Battery Power Supply (BPS) &/or Supplementary Notification Appliance Circuit (SNAC): These types of panels shall be completely maintenance free, shall not require liquids, fluid level checks or refilling, and shall not be capable of producing spills and/or leaks. Batteries shall be sealed gel-cell type with expected life of 10 years. Battery voltage shall be as

required by the FACP and related equipment. Battery shall have sufficient capacity to power the fire alarm system for not less than 24 hours plus 15 minutes of alarm upon a normal AC power failure. Battery cabinet shall be twice the size of the batteries it will contain. NAC circuits shall not exceed 75% of maximum current load allowed.

k. Surge Protection: The following protection against voltage transients and surges must be provided by the fire alarm equipment supplier, and installed by the electrical contractor:

1) On AC Input: A feed-through (not shunt-type) branch circuit transient suppressor such as Leviton 51020-WM-DN, or Di-Tech DTK-120S20A, or equivalent UL 1449- 2nd Edition Listed device.

2) On DC Circuits Extending Outside Building: Adjacent to the FACP, and also near point of entry to outlying building, provide “pi”-type filter on each leg, consisting of a primary arrestor, series impedance, and a fast acting secondary arrestor that clamps at 30v-40v. Some acceptable models: Simplex 2081 -9027, Simplex 2081 -9028, Transtector TSP860I, Ditek DTK 2MHLP24B series, Citel America B280-24V, and Northern Technologies DLP-42. Submit data on others to the engineer for approval. UL 497B listing is normally a prerequisite for their consideration. Devices using only MOV active elements are not acceptable.

5. Wiring

a. Addressable loop (signaling line) circuits shall be wired with type FPL/FPLR/FPLP fire alarm cable, AWG 18 minimum, low capacitance, twisted shielded copper pair. Cable shield drain wires are to be connected at each device on the loop to maintain continuity, taped to insulate from ground, and terminated at the FACP. Acceptable cables include Atlas 228-18-1-1STP, BSCC S1802s19 (same as EEC 7806LC), West Penn D975, D991 (AWG 16), D995 (AWG 14), or equal wire having capacitance of 30pf/ft. maximum between conductors. Belden 5320FJ acceptable if only FPL rating needed. The cable jacket color shall be red, with red (+) and black (-) conductor insulation.

1) Unshielded cable, otherwise equal to the above, is permitted to be used if the manufacturer’s installation manual requires, or states preference for, unshielded cable.

2) In underground conduit, use Type TC or PLTC cable (PE insulated) to avoid problems from moisture.

C. EXECUTION

1. FIRE ALARM SYSTEM:

a. The fire alarm system shall be new and furnished with a warranty (parts & labor) of at least one year from the date of final inspection and/or acceptance by the Owner. Equipment, initiating devices, and alarm appliances shall be arranged and the annunciator zones shall be configured as described by the engineer’s written specifications.

b. All equipment supplied must be specifically listed for its intended use and shall be installed in accordance with the manufactures recommendations. The contractor shall consult the manufacturer’s installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation. Contractor shall refer to the Riser/Connection diagram for all specific system installation/termination/wiring data.

c. All system components shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load. Adhesives are not permitted to mount fire alarm system components to building surfaces or structure.

d. When programming the system, activate the automatic drift compensation feature for all spot-type smoke detectors. Systems with alarm verification are not to have this feature activated without written direction from the owner's representative or the AHJ. Alarm verification must not be used with multi-sensor/multi-criteria detectors under any circumstances, as inadequate system response may result. Most applications of analog addressable smoke detectors do not require alarm verification to reduce nuisance alarms, as they are better able to discriminate between fire and common non-fire ambient events. A short operational test with normal occupancy can determine if transient ambient events are a problem

e. Set spot-type smoke detector sensitivities to normal/medium, unless directed otherwise by the design engineer/owner's rep. High sensitivity may be appropriate in relatively benign, clean environments such as art museums and libraries, to improve system response time without causing nuisance alarms

f. Print a complete System Status and Programming Report after the above steps have been done. This must include the program settings for each alarm initiating device and the current sensitivity of each analog addressable smoke detector.

g. Coordinate with owner for requirements associated with standard and customized messages for voice evacuation.

2. FIRE ALARM CONTROL EQUIPMENT INSTALLATION

a. The technician who makes final connections and programs the FACP is the "installer" even though most field connections to system devices and appliances are normally made by electrical contractor personnel. The responsibility for assuring a proper installation overall rests with this individual fire alarm system technician. In addition to doing the final hookups and activating the system, this individual is expected to check the field connections to assure all work is properly done. The absence of system "trouble" signals is not a sufficient measure of the field wiring, which could have "T" taps, the wrong type of wire, improper terminations, ground (drain wire) issues, etc.

b. Avoid placing the FACP in a locked room, since this could delay access during an emergency. Avoid M/E rooms for the same reason, and because the environment there is often inhospitable to electronics. Proper location of the FACP can make an FAA redundant. Possible location is the main entrance of a building.

c. Notification Appliance Circuit booster power supplies must be individually monitored by the FACP and protected by a smoke detector per NFPA 72. They shall not be located above a ceiling, or in non-conditioned space. A 24vdc power circuit serving addressable control relays must also be monitored for integrity.

d. Basic operating instructions shall be framed and permanently mounted at the FACP. (If the owner concurs, they may instead be affixed to the inside of the FACP's door.) In addition, the NFPA 72 "Record of Completion" must either be kept at/in the FACP, or its location shall be permanently indicated there by an engraved label.

e. Provide an engraved label inside the FACP identifying its 120vac power source, as follows: Panelboard location, panelboard identification, and branch circuit number.

f. Alarm notification appliances (audible and visible) are to comply with NFPA 72, the North Carolina Building Code, and ICC A117.1-2009 criteria for intensity and placement. The standard audible evacuation signal is the ANSI S3.41 three-pulse temporal pattern except it shall not be used if the planned action during fire emergency is to relocate occupants or protect in place, instead of immediate evacuation (e.g., some health care facilities, prisons). All strobe lights installed in a single space must be synchronized. Devices are allowed to be mounted on the ceiling with 80" minimum and 96" maximum. See the NFPA 72 for additional alarm notification appliance requirements for special situations.

3. ADDRESSABLE INTERFACE MODULES (Control and Monitor Modules)

    a. Addressable interface modules (used to monitor all contact type initiating devices) must be located in conditioned space, unless they are tested, listed, and marked for continuous duty across the range of temperatures and humidity expected at their installed location.

    b. One module can serve as many as 3 sprinkler system valve supervisory switches in a single space; otherwise provide one module per switch.

    c. One module may serve as many as 6 heat detectors, in a single space.

    d. Sprinkler system supervisory circuits for monitoring valve position, air pressure, water temperature, pump status, etc., must cause distinct audible and visible indications at the FACP. The audible supervisory signal shall either be a 4" diameter bell or a pulsing piezoelectric alarm. Provide the following engraved label adjacent to the bell/alarm: "SPRINKLER STATUS ABNORMAL". If only valve position is supervised, provide an engraved label reading: "SPRINKLER VALVE CLOSED".

    e. The numbers of the fire alarm devices in a loop shall not exceed 20 devices otherwise provide IM module.

4. SURGE PROTECTION

    a. For each AC power circuit that interfaces with fire alarm equipment install an AC suppressor in a listed enclosure near the electrical panelboard, and trim excess lead lengths. Wind small coil in the branch circuit conductor just downstream of the suppressor connection. Coil to be 5 to 10 turns, about 1" diameter, and securely tie-wrapped. This series impedance will improve the effectiveness of the suppressor in clipping fast rise time voltage transients.

    b. On DC Circuits Extending Outside Building: Install the surge arrestor in a labeled enclosure near the point of entry to or exit from each building.

5. AC POWER

    a. Systems are to be provided with a separate and independent source of emergency power. Switching to emergency power during alarm shall not cause signal drop-out. Batteries must meet the appropriate NFPA capacity requirements, with a 25% safety factor.

    b. The branch circuit breaker(s) supplying the system must be physically protected by panelboard lock or handle lock and each must be identified with a 1/4" permanent red dot applied to handle or exposed body area.

    c. Provide an engraved label at each fire alarm system control unit, system sub-panel or data gathering panel, supplementary notification appliance (SNAC) panel, digital alarm communicator, etc.

    d. The fire alarm system shall monitor 120vac power to shunt trip breakers used in conjunction with fire suppression system. Examples include a shunt trip used for cooking appliance power shut-off when the kitchen hood fire suppression system shoots, or primary elevator power shut-down upon sprinkler flow in any elevator equipment space or shaft. Use an addressable monitor module to accomplish this supervisory function.

6. CONDUIT AND WIRING

    a. The exterior of all junction boxes containing fire alarm conductors shall be painted red; box interiors shall not be painted. Or Box covers for junction boxes containing fire alarm conductors shall be painted red on both sides.

b. Box covers shall be labeled to indicate the circuit(s) or function of the conductors contained therein. Labels shall be neatly applied black lettering on a clear background. Handwritten labels or labels made from embossed tape are not acceptable.

c. All fire alarm system wiring shall be in metal conduit or surface metal raceway. All fire alarm system raceway, couplers, and connectors must meet the performance and installation requirements of Electrical Specification Section “RACE WAYS”.

   1) If cable size and the requirement to maintain a Class “A” loop on all Signaling Line Circuits cause conduit fill to exceed specified maximums for the 1/2” size; therefore, 3/4” raceway should be used.
   2) PVC conduit is permitted to be used underground, in concrete, and in locations approved by the AHJ.
   3) Engineers shall discuss buildings on the historic register with the AHJ.

d. All conduits that penetrate outside walls from air conditioned space must have internal sealing (duct-seal), to prevent condensation from infiltrating humid air

e. All wiring shall be color coded All the circuits in the system shall be wired with AWG 14, minimum, stranded copper, THHN/THWN conductor, installed in metallic conduits. Color Coded wires shall be in accordance with the following scheme, which shall be maintained throughout the system, without color change in any wire run:

1)	Initiating Circuits, General	Red (+)/White (-)
2)	Initiating Circuits, Smoke Only	Violet (+)/Gray (-)
3)	Signal Line Circuit cable	Red jacket with Red(+)/Black(-)
4)	Alarm Indicating Appliance Circuits	Blue (+)/Black (-)
5)	AHU Shutdown Circuits	Yellow (+)/Brown (-)
6)	Door Control Circuits	Orange
7)	Elevator Capture Circuits	Brown
8)	Speaker Circuits	Red (+)/Black (-)

f. To minimize wiring fault impact, isolation modules shall be provided in all of the locations listed below. If ceiling height is less than or equal to 10 feet, isolator base type initiating devices are permitted to be used to satisfy any or all of the following:

   1) In or immediately adjacent to the FACP, at each end of the addressable loop. These two isolators must be in the same room and within 15 feet of the FACP.
   2) After each 20 initiating devices and control points on the addressable loop, or a lesser number where recommended by the manufacturer. (Check instructions.)
   3) For loops with 20 devices and control points, install an isolator at the approximate middle of the loop (in addition to those at the FACP.
   4) Near the point any addressable circuit extends outside the building, except for those attached to the building exterior walls and well sheltered by walkways.
   5) For loops covering more than one floor, install isolator at terminal cabinet on each floor (with additional isolator[s] on any floor with over 20 addresses).
   6) Each isolation module must be clearly labeled, readily accessible for convenient inspection (not above a lay-in ceiling), and shown on as-built drawings

g. Detection or alarm circuits must not be included in raceways containing AC power or AC control wiring. Within the FACP, any 120 VAC control wiring or other circuits with an externally supplied AC/DC voltage above the nominal 24 VDC system power must be properly separated from other circuits and the enclosure must have an appropriate warning label to alert service personnel to the potential hazard.

h. Style 6 Circuits Required: Systems with one or more addressable sub-panels that (1) have an integral addressable loop controller, or (2) monitor multiple non-addressable initiation zones, shall comply with the NFPA 72 requirements for Style circuits.

i. There shall be no splices in the system other than at device terminal blocks, or on terminal blocks in cabinets. “Wire nuts” and crimp splices will not be permitted. Permanent wire markers shall be used to identify all connections at the FACP and other control equipment, at power supplies, and in terminal cabinets. All terminal block screws shall have pressure wire connectors of the self-lifting or box lug type.

j. In multistory buildings, all circuits leaving the riser on each floor shall feed through a labeled terminal block in a hinged enclosure accessible from the floor. If building layout requires the terminal cabinet to be above a drop ceiling, its location must be clearly and permanently identified with a placard readable from floor. Terminal block screws shall have pressure wire connectors of the self-lifting or box lug type.

k. All wiring shall be checked for grounds, opens, and shorts, prior to termination at panels and installation of detector heads. The minimum resistance to ground or between any two conductors shall be ten (10) megohms, as verified with a megger. Provide advance notice to the Engineer of record of these tests.

l. The system shall be electrically supervised for open or (+/-) ground fault conditions in SLC, alarm circuits, and control circuits. Removal of any detection device, alarm appliance, plug-in relay, system module, or standby battery connection shall also result in a trouble signal. Fire alarm signal shall override trouble signals, but any pre-alarm trouble signal shall reappear when the panel is reset.

7. NOTIFICATION DEVICES

a. Both audible and visible alarm signals shall be provided. Visible signals must be the strobe (flash discharge) type, with white or clear lens, and shall comply with current ADA requirements for intensity and placement.

b. Alarm notification appliance (NAC) circuits shall be NFPA 72 Style Y (Class B). The load connected to each circuit must not exceed 80% of rated module output and the coverage of each circuit shall not exceed 3 floors (to limit the effect of faults, and to facilitate troubleshooting). The NAC voltage drop during alarm must not exceed 14% of the voltage measured across the batteries at that time. To achieve this, the design must consider wire size, length of circuit, device load, inherent voltage loss within the FACP‘s power supply, etc. The contractor shall use power outage testing to verify that the NAC circuit was designed and installed properly.

c. End of Line (ECU Device): The end of line device shall be installed in accessible terminal cabinets or dedicated accessible boxes, to facilitate testing and maintenance.

8. DETECTORS

a. Detectors used for elevator: Primary, alternate recall points and the machine room & the shaft shall be indicated on the control Matrix. Elevator capture or control signals shall come from the FACP as relayed by control modules.

b. The FACP and all other control equipment locations, including any transponders, sub-panels, and booster power supplies, must be protected by a spot type smoke detector located within 15 feet of the equipment (measured horizontally).

c. When installed in a room, detectors shall be oriented so their alarm light is visible from the nearest door to the corridor, unless Remote Alarm Indicator Light (RAIL) equipped.

d. Spot-type smoke detectors shall secure the head to the base thru the built-in locking device. For detector mounted within 12 feet of the floor, activate this lock after the system has been inspected and given final acceptance.

e. Spot-type smoke detectors shall not be used where ceiling height exceeds 25 feet because it makes access for maintenance very difficult and could impede response. Projected beam smoke detectors are recommended for these applications because they can be mounted on wall surfaces, where access is convenient (or at least where they can be reached with an extension ladder). These integrating devices can be located to compensate for possible smoke stratification. Refer to NFPA 72.

f. Unless suitably protected against dust, paint, etc., spot type smoke detectors shall not be installed until the final construction clean-up has been completed. In the event of contamination during construction, the detectors must be replaced by the contractor at no additional cost to the Owner. Covers supplied with smoke detector heads do not provide protection against heavy construction dust, spray painting, etc., and must not be used for that purpose. They are suitable only during final, minor cleanup or touchup operations.

g. A detector installed where accidental damage or deliberate abuse is expected shall be provided with a guard that is listed for use with it and is acceptable to the AHJ.

   1) Mechanical guards always make access for regular testing and maintenance more difficult. Therefore, the preferred approach, where practical, is to relocate the detectors out of harm's way, consistent with proper device response.

h. Identification of individual detectors is required. Assign each a unique number as follows, in sequence starting at the FACP: (Addressable Loop # -- Device #) Show on the as-built plans, and also permanently mount on each detector's base so that it's readable standing on the floor below without having to remove the smoke detector. Exception: For detectors with housings (i.e., air duct, projected beam, air sampling, flame), apply the identification to a suitable location on exterior of their housing. Device labels may not be affixed to the device. Identification labels must be printed labels with black lettering on a clear background. Handwritten labels or labels made from embossed tape are not acceptable.

9. DUCT MOUNTED SMOKE DETECTORS

a. All air duct/plenum detectors must have a Remote Alarm Indicator Lamp (RAIL) installed in the nearest corridor or public area and identified by an engraved label affixed to the wall or ceiling. Duct smoke detectors are permitted to be installed only inside an air duct. It is not appropriate to mount them in front of a return air opening. Duct detectors shall also be installed in a manner that provides suitable, convenient access for required periodic cleaning and calibration. The numbers of detectors per duct shall be per NFPA 72 requirements based on the size of the air duct, air duct configuration, air speed, and duct manufacture's installation requirements.

b. Each duct detector installation shall have a hinged or latched duct access panel, 12x12 inches minimum, for sampling tube inspection and cleaning. Indicate airflow direction on the duct, adjacent to the detector, using stencil or permanent decal.

c. Duct detector sampling tubes shall extend the full width of the duct. Those over 36 inches long must be provided with far end support for stability.

   1) The preferred method for providing support is to extend the intake tube through the far side of the duct, seal around the tube where it penetrates the duct wall, and plug the end with a rubber stopper. This facilitates visual inspection, intake tube cleaning, and injection of smoke or equivalent aerosol for testing the detector.

d. Duct smoke detector mounting position and air sampling tube orientation, are critical for proper operation. The Manufacturer's detailed installation instructions must be followed. The contractor shall mark the direction of air flow on the duct at each duct detector location.

e. Unless the AHJ requires otherwise, all duct smoke detectors shall be programmed for fire alarm (not for supervisory annunciation).

10. PRINTER: An event printer is required for all systems exceeding 100 addressable points, or if the building exceeds 3 occupied floors or 60,000 SF. Provide a 120vac tractor feed printer that uses ordinary (non-thermal) paper. Install in location selected by the owner.

11. AIR HANDLER UNIT (AHU) SHUTDOWN

    a. A supervised "AHU Shutdown Defeat" switch must be provided in/adjacent to the FACP or as a key-operated function in the Remote Annunciator (if provided). If the FAA option is utilized, provide an informative engraved label at the FACP about this function. The switch must cause a system "trouble" indication when it's placed in the off-normal ("Shutdown Defeated") position. This is to provide the owner with a convenient means to temporarily resume HVAC operation in the event an unwanted alarm will not clear, prior to arrival of the fire alarm service technician.

    b. If the system includes AHU shutdown or smoke removal startup, silencing the alarm (without resetting) must not reverse the shutdown. A supervised "AHU Shutdown Defeat" switch must be provided in the FACP. The switch must be labeled and its "Normal" position indicated. Provide supervised Hand-Off-Auto switch(es) at the FACP for any building smoke control equipment (pressurization or exhaust fans).

12. ANNUNCIATOR – Provide addressable LCD annunciator at main entrance and at fire pump house.

13. ALARM VERIFICATION FOR SMOKE DETECTORS. The fire alarm system shall be equipped with Alarm Verification.

13A. Emergency Voice/Alarm Communications

    a. The system shall provide for a One-Way Emergency Voice (PA-Type) System.

        1. The One-Way Voice/Alarm (PA) installation shall be dual channel, permitting the transmission of an evacuation signal to one or more zones and simultaneous manual voice paging to other zones, selectively and in any combination. For all buildings, the one-way voice alarm (PA) communication system must meet the following requirements:

            a. Each floor, stairway, elevator bank and assembly space (greater than 300) shall be a separate communication zone. Speakers shall be tapped to meet required audio levels.

            b. Speakers in stairwells shall be installed at every 3rd Floor landing.

            c. Normal audio amplifier power shall be a minimum of 120% of the system design load per channel. For purposes of this calculation, use the amplifiers continuous two-tone output rating and the designed power setting of each individual speaker. Provide a copy of calculation with shop drawing submittal to the engineer. Also include calculation sheet as part of as-built drawings.

            d. At least one back-up amplifier shall be provided for each channel, equal in power to the largest primary amplifier. For systems with distributed amplifiers, provide one backup at each transponder location. Failure of any amplifier shall automatically result in the defective unit being switched off-line and replaced with the backup.

            e. The audible emergency evacuation system shall comply with 1.11. This does not preclude the system from providing additional (non-evacuation)

notification signals, including recorded voice messages for specific emergency situations. Provide minimum 16 custom messages coordinated closely with owner. The messages shall also be bi-lingual as identified by owner.

f. The Auditorium and Main Gym locations shall be zoned separately and provided with a mic station (LOC) mounted in a recessed protective enclosure. This will allow owner to have local override capability when events are being held in those locations. Also note main receptions shall also be provided with a (LOC) for owner use.

g. Digital audio circuits shall be wired with twisted pair copper conductors (AWG18 minimum) in jacketed cable. Analog audio circuits shall be wired with (AWG 18 minimum) twisted pair copper conductor in shielded cable, Belden 8790, West Pen 293 or equal. Cable jacket shall be gray, with red (+) and black (-) conductor insulation. For shielded cables, the shield must be continuously connected from the amplifiers to the end of the line. Tape the shield splice at each speaker and handset, to insulate the ground, single point ground the shield at the amplifier or control unit unless prohibited by system manufacturer.

h. Voice Communications Equipment shall be housed in the FACP. All connections between voice communications equipment and fire alarm equipment shall be made via cables or harness assemblies which have been prewired and tested by manufacturer.

i. Design basis for speaker placement on plans use tap settings as follows: Classrooms ½ watt; corridors ¼ watt; other areas ½ watt; cluster speakers 7 ½ watts. Due to the fact these are design basis tap settings, the contractor shall, during final checkout, make adjustments to taps accordingly to meet the Acoustically Distinguished Space (ADS) measurements within the STI range of .6 to 1.0 and CIS range of .78 to 1.0. This shall apply for each space. Test report shall be turned over to the engineer for final review and approval.

14. REMOTE ALARM TRANSMISSION REQUIREMENTS

a. Each system with automatic fire detection, or which monitors a sprinkler system, shall be equipped with a 4-channel (minimum) Digital Alarm Communicator Transmitter (DACT) for transmission of fire alarm, supervisory, and trouble signals to a Central Station, Remote Supervising Station, or Proprietary Supervising Station. DACT shall be dual line type in accordance with NFPA 72. Monitoring shall be included in fire system cost.

b. The following signals shall be reported as applicable:

- Fire Alarm
- Sprinkler Waterflow Alarm
- Sprinkler Valve Tamper (Closed) Supervisory Signal
- Sprinkler Low Temperature I Air Pressure Supervisory Signal
- Fire Alarm System AC Power Trouble (only if 120vac interrupted for 1 to 8 hours)

c. Sprinkler supervisory signals are permitted to be combined by the DACT, for transmission. Contact the AHJ for more information.

d. The precedence of DACT I signals transmitted to the Supervising Station shall be as follows:

1) Fire Alarm

2) Supervisory Signal
3) Trouble Signal*

e. Do not confuse fire suppression system “supervisory” signals and fire alarm system “trouble” signals. These are completely different types of signals, annunciated and transmitted as separate and distinct events.

f. The Contractor must provide a type of DACT (Analog/Cellular/VOIP) that is compatible with the owner’s alarm receiving equipment, or the Supervising Station selected by the owner, as applicable. He must also program the PROM, connect each DACT to the telephone line(s) provided to him, and verify proper signal receipt by the Supervising Station. The transmission means shall comply with the latest NFPA 72 2013 requirements. Coordinate with the Local Fire Marshall and Owner prior to purchasing the DACT.

15. AUTOMATIC SMOKE DOOR AND AUTOMATIC LOCK REQUIREMENTS

a. Wall-mounted magnetic door holders and separate heavy-duty closers shall be used, instead of combination door control units. The electromagnets shall be controlled by the building’s smoke detection system FACP. Individual smoke detector auxiliary contacts shall not be used to release door holders.

b. Automatic door locks controlled by the system must be either fail safe magnetic locks or failsafe electro-mechanical with reverse bevel dead bolts.

c. All locked protected doors must immediately unlock upon fire alarm, loss of AC power, disablement of the fire alarm system (defined as loss of 24 VDC power) or upon manual operation of an unlock switch at a constantly attended location.

16. SPRINKLER SYSTEM MONITORING

a. The following sprinkler system alarm and supervisory functions shall be provided as a part of the fire alarm system:

1) Waterfiow alarm, by sprinkler zone (not to exceed one floor).
2) Supervision of each control valve.
3) Supervision of air pressure, if used (both high and low).
4) Supervision of fire pump.

b. Sprinkler supervisory monitoring of flow switches, tamper switches, and similar functions shall be accomplished with a separate system address for each activity monitored.

17. KITCHEN EXHAUST HOOD EXTINGUISHING SYSTEMS

a. Installation shall comply with the current edition of NFPA 72 Standard for the type of system installed.

b. System(s) shall be interconnected with the fire alarm system as a separate system address.

c. The exhaust fan must continue running after the system has been discharged, (except on carbon dioxide systems) to remove smoke; the supply fan should stop. All sources of heat for appliances served by the extinguishing system (both electric and/or gas) must be turned off.

18. FIRE ALARM SYSTEM INSTALLATION AND CONFIGURATION

a. Supervision required: The connections between individual addressable modules and their contact type initiating device(s) must be supervised.

b. Graphic Chart must be mounted behind Plexiglass and secured to surface at all RACP and FACP locations. Mounting shall be such that charts cannot be removed without a flat head screwdriver.

c. Floor Plans with Device Numbers: A copy of the floor plans shall be provided in the control panel. A separate sheet shall be provided for each floor. Plans shall be reduced in size from engineering plans in order to fit on 11 x 14 sheets. All device addresses shall be clearly labeled on plans. Indicate locations of all cabinets, modules and end of line device. Plans shall be bound in book form. Sheets shall be laminated. Provide legend for symbols. Provide holder for plan book in panel or in a locked box adjacent to panel keyed to match panel. Provide label for box and book.

d. Loop 1 shall be assigned to the first floor devices and loop number shall increase with floor number. Device numbering starts in the same location on each floor and increase accordingly as circuit location increases.

19. FIRE AND LIFE SAFETY CRITERIA FOR DOORS CONTROLLED BY FIRE ALARM SYSTEM:

a. For life safety reasons, any exit or exit access doors that are locked to delay egress, in accordance with the NC Building Code, must utilize one of the following types of locking hardware:

1) Magnetic Lock (fail-safe) utilizing a 24vdc magnet and contact plate
2) Electro-Mechanical Lock (fail-safe) with reverse bevel type dead bolt

b. These doors must immediately unlock upon any fire alarm signal, loss of building AC power, disablement of the fire alarm system (defined as loss of its 24vdc power), or upon manual operation of an unlock switch at a constantly attended location.

c. Where installed on smoke or fire doors, power failure shall cause these mechanisms to default to the egress mode with normal mechanical latching

1) This is to assure the smoke or fire doors continue to perform their vital function in a power failure situation, instead of swinging open and allowing the passage of smoke and fire between compartments.

d. Smoke doors are permitted to be held open by 24vdc wall/floor-mounted magnets powered by the FACP, and released upon alarm. The resulting current drain shall be included in the standby battery calculations or the system must be programmed to drop the door hold-open magnet load 60 seconds after the loss of 120vac power

e. Wall-mounted magnetic door holders and separate heavy-duty closers are recommended for control of smoke doors, instead of combination frame-mounted units that include an integral smoke detector and control mechanism, due to long-term reliability problems with the latter. Although ac-powered electromagnets are available, they have several disadvantages including the need for many additional addressable control relays, the Code requirement to separate power limited and non-power limited circuits, safety considerations for fire alarm maintenance personnel (some magnets are 120vac), and noticeable door hum caused by the magnets operating on self-rectified voltage (“raw”, unfiltered dc from integral bridge rectifier). Relevant NFPA 72 Standards require that smoke door to floor clearance not exceed 3/4 inch and that the gap between door pairs not exceed 1/8 inch.

f. For life safety reasons, all rolling steel fire doors must descend at a constant rate of 0.5 to 2 foot/second maximum, whether released by their thermal link or closed by FACP command. Also, in response to strong requests from many facility managers, these fire doors must either: (1) Automatically reset when raised to their normal position, or (2) Have a motor down - motor up mechanism controlled by the FACP

g. Contact the AHJ for guidance on programming the fire alarm system to determine which fire alarm initiation devices should cause release of these doors. The customary setup is to have this done for selected smoke detector and/or waterflow alarm in adjacent spaces, rather than upon general alarm, to minimize the potential disruption of possible nuisance alarms in remote parts of the building. The FACP should have an appropriate information placard regarding this function, to avoid nuisance drops during routine system maintenance operations.

h. The Audio Sound Systems in the Auditorium and the Main Gymnasium shall be muted when the Voice Annunciated Fire Alarm System Alarms. Provide interconnection with Sound systems in those areas. See Theatrical AV Drawings for Single Line Audio Systems for reference.

i. The fire alarm system contractor shall provide and install all required NAC panels, transponders, etc. for a complete and 100% functional fire alarm system.

j. The fire alarm contractor shall coordinate closely with the electrical contractor for all required 120V power required. Electrical contractor shall provide and install conduit, wiring, breakers, surge suppressors require to support these power supplies. These shall be identified on as-built plans at completion of project. Breaker locks are required for each circuit breaker.

20. SYSTEM DOCUMENTATION, TRAINING, AND MAINTENANCE

a. Maintenance: The manufacturer, or authorized distributor, must maintain software version records on the system installed. The system software shall be upgraded free of any charge if a new VER is released during the warranty period. For new VER to correct operating problems, free upgrade shall apply during the entire life of the system.

b. System Report In addition to the Shop Drawing submittal described elsewhere, the fire alarm system contractor shall provide the engineer two bound copies of the following technical information, for transmittal to the owner:

1) As-Built wiring diagram showing all loop numbers and device addresses, plus terminal numbers where they connect to control equipment.

2) As-built wiring and conduit layout diagrams, including wire color code and/or label numbers, and showing all interconnections in the system.

3) Electronic circuit diagrams of all control panels, modules, annunciators, communications panels, etc.

4) Manufacturer’s detailed maintenance requirement.

5) Technical literature on all control equipment, isolation modules, power supplies, batteries, detectors, manual stations, alarm/supervisory signal initiating devices, alarm notification appliances, relays, remote alarm transmission means, etc.

6) The as-built “calculations” sheet.

c. Electronic archive: Complete configuration data (site-specific programming) for the system must be stored on electronic media and archived by the fire alarm system manufacturer or authorized distributor. A diskette or CD copy of this data shall be submitted to the engineer for transmission to the owner on the day the system is commissioned.

d. The contractor shall provide the owner with one copy of the following:

1) All software required, both for the installed fire alarm system and personal computer (PC) necessary to access the fire alarm system for trouble shooting, programming, modifications, monitoring, de-bugging, or similar functions, (if Owner does not have the needed PC to check the system).

2) Complete documentation for all software for both the installed fire alarm system and for any interface PC software necessary for system functions as described above.

3) Framed floor plans, mounted at the FACP and RACP. Plans shall show all system devices with the unique device identification numbers indicated adjacent to each device. The identification numbers shall match those represented in the as-built drawings and those reported at the FACP and the LCD annunciator.

4) Interconnection cable where such is required to connect the fire alarm system to a PC; (if Owner does not have the needed PC to check the system)

e. The manufacturer's authorized representative must instruct the owner's designated employees in operation of the system, and in all required periodic maintenance. A minimum of 8 hours on-site time will be allocated for this purpose and, for those facilities operating on a 24-hour basis (prisons, hospitals, etc.) one additional hour of instruction will be individually provided for the 2nd and 3rd shift. Two copies of a written, bound summary will be provided, for future reference.

1) Some facilities maintain their own systems and require more in-depth training. Check to verify needs and requirements.

2) Scheduling of training must be arranged to meet the Owner's schedule. Additional training shall be available at a cost to be mutually agreed upon by the Owner and the Contractor.

3) Training shall be in the Owner's provided classroom.

4) The training may not be waived, deleted or reduced in the number of hours required.

5) Training shall cover as minimum the following topics:

a) Preventive maintenance service techniques and schedules, including historical data trending of alarm and trouble records.
b) Overall system concepts, capabilities, and functions. Training shall be in depth, so that the owner shall be able to take any device out of service and return any device to service without need of Manufacture's approval or assistance.
c) Explanation of all control functions, including training to program and operate the system software.
d) Methods and means of troubleshooting and replacement of all field wiring devices.
e) Methods and procedures for troubleshooting the main fire alarm control panel, including field peripheral devices as to programming, bussing systems, internal panel and unit wiring, circuitry and interconnections.
f) Manuals, drawings, and technical documentation. Actual system software used for training shall be provided in digital form and shall be left with the Owner at the completion of training for the Owner's use in the future.

21. SPARE PARTS:

a. The following spare parts shall be provided with the system. For multi-building projects, calculate quantities separately for each building that contains a dedicated fire alarm control panel. If FACP also serves auxiliary buildings (e.g., storage, boiler/chiller), calculate as if one building. Increase decimal quantities to the next higher whole number.

• Fuses (If Used)	2 of each size in system
• Manual Fire Alarm Boxes	2% of installed quantity

• Addressable Control Relays	4% of installed quantity
• Indoor Speakers with Strobes Lights	4% of installed quantity
• Indoor Strobe-only Notification Appliances	4% of installed quantity
• Monitor Modules (Addressable Interface)	4% of installed quantity
• Isolation Modules I Isolation Bases	4% of installed quantity
• Addressable, Electronic Heat Detectors	4% of installed quantity
• Spot-Type Smoke Detectors I Sounder Bases	6% of installed quantity
• Indoor/Outdoor Speakers	4% of installed quantity

* No spares are required for projected beam, air sampling, or duct smoke detectors

22. SYSTEM TESTING & CERTIFICATION

a. Upon completion of the installation the Contractor and the Manufacturer's authorized installer together shall conduct a 100% performance test of each and every alarm initiating device for proper response. The system shall operate for 48 hours prior to start of test. The Contractor shall be present for the full 100% test.

b. The A/E and owner must be given 7 days advance notice of the tests. All Audio-Visual Device Testing shall be scheduled with the owner.

c. 100% Test: The manufacturer or authorized distributor (by definition, "installer") must 100% test all site-specific software functions for the system and then provide a detailed report or check list showing the system's operational matrix. This documentation must be part of the "System Status and Programming Report".

1) Upon completion of the installation and its programming, the installer's technician shall test every alarm initiating device for proper response and indication, and all alarm notification appliances for effectiveness. Also, in coordination with the other building system contractors, all other system functions shall be verified, including (where applicable) elevator capture and the control of HVAC systems, door locks, pressurization fans, fire or smoke doors/dampers/shutters, etc. The engineer must be notified in advance of these 100% tests, to permit witnessing them if desired.

2) If AHU shutdown occurs for any alarm, then the matrix would indicate the specific control relay(s) for that function being commanded to operate for alarm from any initiating device. If a rolling steel fire door is to drop only upon waterflow alarm from its sprinkler zone, or upon any two spot smoke detectors in adjacent spaces being simultaneously in alarm, the matrix would show the door's control relay activating upon alarm from the applicable waterflow switch(es), or from any two smoke detectors in the selected spaces (AND gate).

3) The digital communicator shall be on-line and tested for proper communication to the receiving station.

4) All supervised circuits must also be tested to verify proper supervision. (Control circuits and remote annunciation lines are among those required to be supervised.)

5) All testing described above shall be repeated in the event that subsequent software or wiring modifications are determined necessary to meet the requirements of the contract documents. Such re-testing shall be included as part of the base bid and provided at no additional cost to the Owner.

d. Test Documentation: The installer must fill out and submit the following documentation to the owner, through the engineer, prior to the AHJ's system acceptance inspection:

1) Written verification that this 100% system test was done with copy of print out generated during test.

2) The NFPA 72, "Record of Completion" Form. Use this form (no substitutes) to detail the system installation and also to certify that: (a.) It was done per Code, and (b.) The Code-required 100% test was performed. The fire alarm installer (manufacturer or authorized distributor's technician) must sign this form. If a representative of the AHJ, owner, or engineer witnesses the tests, in whole or in part, they must also sign the form to signify that fact only (annotating the form as needed to clarify their limited role).

3) The System Status and Programming Report described in NFPA 72. This must be generated on the day of the system acceptance inspection and shall include the measured sensitivity of each smoke detector.

4) The purpose of doing Item (3) on the day of the inspection is to assure detector sensitivity has not been affected by construction dust. Prudent contractors will have taken measures to prevent detector contamination during construction and will also have had the system do a detector sensitivity test and printout prior to the day of the inspection, to make certain all devices are properly programmed and operating within their limits.

e. After completion of the 100% system test and submission of documentation as described above the installer is to request the engineer to set up an inspection. The system must operate for at least two days prior to this inspection The responding Fire Department shall be notified of this, for pre-fire planning purposes. On local government projects, local fire authorities may also want to participate in system acceptance inspections. However, for State-owned property they have no inspection jurisdiction and, if present, are only to observe.

23. PRE-FINAL INSPECTION: At the Owner's request and after passing the Designer's pre-final inspection, the Contractor and Manufacturer's authorized installer will conduct system test in the presence of the Owner and the Designer.

24. FINAL INSPECTION: The fire alarm system will be inspected, with portions of it functionally tested. This will normally include the use of appropriate means to simulate smoke for testing detectors, as well as functionally testing the system interface with building controls, fire extinguishing systems and any off-premises supervising station. Operation of any smoke removal system will be checked as instructed by the AHJ. This statistical (sampling) inspection is intended to assure that the contractor has properly installed the system and performed the 100% operational test as required by NFPA 72. The electrical contractor shall provide two-way radios, ladders, and any other materials needed for testing the system, including a suitable smoke source.

a. Smoke control and smoke management systems are normally tested by measuring air flow rates and pressure differentials, plus observing any effect the system has on the operation of exit, elevator, and stairway doors. Testing with smoke "bombs" (smoke candles) is NOT appropriate because they produce cold chemical smoke that lacks buoyancy and, therefore, does not rise like the smoke from a fire.

b. The test will be conducted entirely by the Contractor. A copy of the final database software must be presented to the Owner before this test. The software shall be loaded from these disks into the system in the presence of the Owner. The review will then be conducted using this software. Any deficiencies shall be recorded and corrected. After the items have been corrected, the system shall be tested again.

1) In the event of malfunctions or excessive nuisance alarms, the Contractor must take prompt corrective action. The Owner may require a repeat of the Contractor's 100% system test, or other inspections.

2) Test Report: Upon successful completion of the Inspection and after the correction of all efficiencies, the manufacturer's authorized representative shall issue a test report to the Engineer and Owner, detailing and certifying the test.

3) System Acceptance: After successful completion of the Final Inspection and recommendation of the Engineer, the system will be accepted by the Owner. At this time the warranty period begins.

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DIVISION 31

SECTION 31 10 00: SITE CLEARING

31 10 00.01: GENERAL

A. RELATED DOCUMENTS

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. SUMMARY

1. This Section includes the following:

   a. Protecting existing trees, plants, and grass to remain.
   b. Removing existing trees, plants, and grass.
   c. Clearing and grubbing.
   d. Stripping and stockpiling topsoil.
   e. Temporary erosion and sedimentation control measures.

2. Related Sections include the following:

   a. Division 01 Section "Temporary Facilities and Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and temporary erosion and sedimentation control procedures.
   b. Division 01 Section "Execution Requirements" for verifying utility locations and for recording field measurements.
   c. Division 02 Section "Selective Demolition" for partial demolition of buildings or structures undergoing alterations.
   e. Division 31 Section "Earth Moving" for soil materials, excavating, backfilling, and site grading.
   f. Division 32 Section "Lawns and Grasses" for finish grading including preparing and placing planting soil mixes and testing of topsoil material.

C. DEFINITIONS

1. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.

2. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

D. MATERIAL OWNERSHIP

1. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

E. SUBMITTALS

1. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

2. Record drawings, according to Division 01 Section "Project Record Documents," identifying and accurately locating capped utilities and other subsurface structural, electrical, and mechanical conditions.

F. QUALITY ASSURANCE

1. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

G. PROJECT CONDITIONS

1. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

   a. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

3. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

31 10 00.02: PRODUCTS

A. SOIL MATERIALS

1. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 31 Section "Earth Moving."

31 10 00.03: EXECUTION

A. PREPARATION

1. Protect and maintain benchmarks and survey control points from disturbance during construction.

2. Locate and clearly flag trees and vegetation to remain or to be relocated.

3. Protect existing site improvements to remain from damage during construction.

   a. Restore damaged improvements to their original condition, as acceptable to Owner.

B. TEMPORARY EROSION AND SEDIMENTATION CONTROL

1. 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 approved sediment and erosion control Drawings and sediment and erosion control plan.

2. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

3. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

C. TREE PROTECTION

1. Erect and maintain temporary fencing around tree protection zones before starting site clearing. Remove fence when construction is complete.

   a. Do not store construction materials, debris, or excavated material within fenced area.
   b. Do not permit vehicles, equipment, or foot traffic within fenced area.
   c. Maintain fenced area free of weeds and trash.

2. Do not excavate within tree protection zones, unless otherwise indicated.

3. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.

   a. Employ an arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.
   b. Replace trees that cannot be repaired and restored to full-growth status, as determined by Architect.

D. UTILITIES

1. 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:

   a. Notify Architect not less than two days in advance of proposed utility interruptions.
   b. Do not proceed with utility interruptions without Architect's written permission.

2. Removal of underground utilities is included in Division 33 Sections covering site utilities.

E. CLEARING AND GRUBBING

1. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.

    a. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
    b. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
    c. Remove roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.
    d. Chip removed tree branches and dispose of off-site.

2. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

    a. 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.

F. TOPSOIL STRIPPING

1. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

    a. Remove subsoil and nonsoil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.

2. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

    a. Do not stockpile topsoil within tree protection zones.
    b. Dispose of excess topsoil as specified for waste material disposal.
    c. Stockpile surplus topsoil to allow for re-spreading deeper topsoil.
    d. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.

G. DISPOSAL

1. Disposal: 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.

2. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

DIVISION 31

SECTION 31 20 00: EARTH MOVING

31 20 00.01: GENERAL

A. RELATED DOCUMENTS

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

2. Subsurface Exploration Report.

B. SUMMARY

1. This Section includes the following:

   a. Preparing and grading subgrades.
   b. Excavating and backfilling.
   c. Subsurface drainage backfill for trenches.
   d. Excavating and backfilling trenches.

2. Related Sections: The following Sections contain requirements that relate to this Section.

   a. Division 01 Sections for allowances, definitions and procedures.
   b. Division 31 Section "Site Clearing" for site stripping, grubbing, topsoil removal, and tree protection.
   c. Division 33 Section "Storm Drainage Utilities" for storm drainage.
   d. Division 31 Section "Soil Erosion and Sediment Control", for all areas of the site that are graded or disturbed by any construction operations.

C. UNIT PRICES

1. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed the following:

   a. 12 inches beneath proposed finish grade.

2. Unit prices for unsuitable soil and rock removal shall include all work and materials as defined in Division 01 sections.

D. DEFINITIONS

1. Excavation consists of the removal of material encountered to subgrade elevations and the reuse or disposal of materials removed. Refer to the following section for additional definitions of classified excavations.

2. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below base course, drainage fill, or topsoil materials.

3. Borrow: Soil material obtained off-site when sufficient approved soil material is not available from excavations.

4. Unauthorized excavation consists of removing soil materials beyond indicated subgrade elevations or dimensions without direction by the Architect. Unauthorized excavation, as well as remedial work directed by the Architect, shall be at the Contractor's expense.

5. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground surface.

6. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within building lines.

E. EXCAVATION CLASSIFICATIONS

1. Excavation Classifications: All excavation is classified as General Excavation except for Rock and Unsuitable Soil Materials as defined in this section.

   a. General Excavation: Excavation, removal and/or disposal of pavements and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished and/or removed; together with soil, boulders, and other materials encountered that are not classified as rock, unsuitable soil, or unauthorized excavation.

      1) Intermittent drilling, blasting, or ripping to increase production and not necessary to permit excavation of material encountered will be considered general excavation.
      2) Soil (irregardless of nature) or other debris encountered above proposed subgrade elevations shall be considered general excavation unless determined by the Architect to meet the definition of rock.

   b. Unsuitable Soil Excavation: Removal and disposal of soil materials or other debris encountered at or below proposed subgrade elevations which is deemed unsuitable to remain in place by the Architect or Owner's Independent Testing Agency.

      1) Soil and/or other debris encountered above proposed subgrade elevations shall be considered general excavation.
      2) Soil material which, in the opinion of the Architect or Owner's independent testing agency, can be repaired by scarifying, drying and recompacting or material which is made unsuitable by delay of work, lack of protection or other actions of the Contractor or his Sub-Contractors shall not be considered as unsuitable soil and shall be repaired or replaced by the Contractor at no additional cost to the Owner.
      3) Any material moved or removed without the measurement by the Owner's independent testing agency and approval by the Architect will be considered as general excavation.
      4) Surface topsoil, regardless of thickness encountered, shall not be considered unsuitable soil.
      5) Stones, rocks and boulders not meeting classifications of rock shall not be considered unsuitable soil. Stones, rocks and boulders shall be removed from soil as necessary if soil is to be used as fill or backfill. Removed stones, rocks and boulders shall be removed from the site.

c. Mass rock Excavation: Removal, in open excavations, of rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1.5-cu.yd. that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted. In the event rock (as defined above) is encountered, the Contractor shall immediately notify the Architect.

1) Mass Rock Excavation Equipment: Late-model, track-type CAT D-8 crawler tractor operating at one mile per hour in the lowest available gear, and at the highest normal operating rpm pulling a sharp, single-toothed ripper. The Contractor shall provide equipment specification and test data verifying that the equipment to be used for demonstration purposes complies with the minimum requirements. The equipment shall be in good repair and in proper working condition. The Owner reserves the right to inspect and approve the backhoe to be used for demonstration purposes. The Contractor shall demonstrate (at no additional cost) to the Architect or Owner's independent testing agency that the rock cannot be practically ripped with equipment equivalent to that specified above without systematic drilling and blasting. Mass rock is defined as material which, after 1 hour of continuous ripping using the equipment described above, produces less than 30 cubic yards of removeable material.

d. Trench Rock Excavation: Removal, in trench excavations, of rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1.0-cu.yd. that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted. In the event rock (as defined above) is encountered, the Contractor shall immediately notify the Architect.

1) Trench rock excavation equipment: Late-model, track mounted CAT 330 or equivalent hydraulic excavator equipped with a narrow bucket with new rock teeth and operating at the highest normal operating RPM. The Contractor shall provide equipment specification and test data verifying that the equipment to be used for demonstration purposes complies with the minimum requirements. The equipment shall be in good repair and in proper working condition. The Owner reserves the right to inspect and approve the backhoe to be used for demonstration purposes. Trench rock is defined as material which, after 1 hour of continuous digging using the equipment described above, removes less than 10 cubic yards of material.

e. Classified excavation requirements:

1) Excavations more than 10 feet in width and pits more than 30 feet in either length or width are defined as open excavations. Excavations less than 10 feet in width and pits less than 30 feet in both length and width are defined as trench excavations.
2) Contractor shall expose and clean the rock material for inspection and measurement by the Architect.
3) Do not excavate rock or unsuitable soil until it has been classified and cross-sectioned by the Owner's independent testing agency or

Architect. Any material moved or removed without the measurement by the Owner's independent testing agency and approval by the Architect will be considered as unclassified excavation.

4) The Architect shall be the final judge on what is classified as unsuitable or rock excavation.
5) The contractor may be required to provide equipment specification data verifying that the above minimum-rated equipment will be used for demonstration purposes. The equipment shall be in good repair and in proper working condition.
6) Rippable rock, weathered rock or overburden which is not classified as rock according to the above definitions shall be considered General Excavation.

F. SUBMITTALS

1. General: Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.

2. Test Reports: In addition to test reports required under field quality control, submit the following:

   a. Laboratory analysis of each soil material proposed for fill and backfill from on-site and borrow sources.
   b. One optimum moisture-maximum density curve for each soil material.
   c. Reports of all laboratory and field tests including evaluations of subgrades and foundation bearing conditions.
   d. As-built survey of athletic fields, courts and tracks demonstrating compliance with specified tolerances.

3. Blasting plan approved by authorities having jurisdiction if applicable due to on- site rock.

4. Report of rock or unsuitable soil removal with quantities confirmed in writing by the Architect or Owner's independent testing agency.

G. QUALITY ASSURANCE

1. Codes and Standards: Perform earthwork complying with requirements of authorities having jurisdiction. Any earthwork required for preparation of parking areas and drives shall comply with current NCDOT Standard Specifications as per the North Carolina Construction Manual, and ONWASA's specifications.

2. Comply with applicable requirements of NFPA 495--Explosive Materials Code.

3. Testing and Inspection Service: Owner will employ a qualified independent geotechnical engineering testing agency to classify proposed on-site and borrow soils to verify that soils comply with specified requirements and to perform required field and laboratory testing.

   a. Off-site borrow material, if any, shall be tested and inspected prior to its use. All soil tests done to qualify off-site fill material for use on-site shall be paid by the Contractor as well as compaction retests required due to failure of the original tests.

4. Pre-installation Conference: Conduct conference at Project site to comply with requirements of Division 01.

   a. Before commencing earthwork, meet with representatives of the governing authorities, Owner, Architect, consultants, Geotechnical Engineer, independent testing agency, and other concerned entities. Review earthwork procedures and responsibilities including testing and inspection procedures and requirements. Notify participants at least 3 working days prior to convening conference. Record discussions and agreements and furnish a copy to each participant.

H. PROJECT CONDITIONS

1. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted in writing by the Architect and then only after acceptable temporary utility services have been provided.

   a. Provide a minimum 48-hours' notice to the Architect and receive written notice to proceed before interrupting any utility.

2. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shutoff services if lines are active.

I. PAYMENT

1. General Excavation: All general excavation to the lines and grades indicated on the drawings including all necessary off-site disposal of excess materials and/or off-site borrow of fill materials shall be included in the base bid.

   a. No statement is made or implied that the on-site grading and earthwork indicated on the drawings is balanced.

2. Unsuitable Soil Material Excavation: Unsuitable soil material excavation in excess of the project allowances will be paid by unit prices included in the Contract Documents.

   a. Unused amounts of monies included under allowances shall be credited to the Owner by deduct change order.

3. Rock Excavation: Rock excavation in excess of the project allowances will be paid by unit prices agreed to by all parties prior to excavation.

31 20 00.02: PRODUCTS

A. SOIL MATERIALS

1. General: Provide approved borrow soil materials from off-site when sufficient approved soil materials are not available from excavations.

2. Imported Fill Materials: ASTM D 2487 soil classification groups SP, SC, and SM; or a combination of these groups, free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter; with a Plasticity Index less than 20 and a Liquid Limit less than 40.

3. Satisfactory Soil Materials: ASTM D 2487 soil classification groups ML, CL, SW, SP,

SC, and SM; free of rock or gravel larger than 2 inches (50 mm) in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter; with a Plasticity Index less than 20 and a Liquid Limit less than 50. Soils free of organics and having a plasticity index greater than 20 but less than 35 and a liquid limit greater than 50 but less than 70 may be used as fill deeper than 4-feet below final grade but only if the soil can be properly compacted.

4. Unsatisfactory Soil Materials: ASTM D 2487 soil classification groups MH, CH, OL, OH, and PT. Soils having a Plasticity Index greater than 35 and a Liquid Limit greater than 70 are also unsatisfactory for use as fill.

5. Unsuitable Soil: Existing, in-place soil, materials or other debris encountered at or below proposed subgrade elevations deemed unsuitable by the Architect or the Owner's independent testing agency to remain in place and/or for use as fill or backfill material or subgrade. Soil material which, in the opinion of the Architect or Owner's independent testing agency, can be made suitable with reasonable densification with multiple passes of a heavy vibratory roller; can be repaired by scarifying, drying and recompacting; and/or material which is made unsuitable by delay of work, lack of protection or other actions of the Contractor or his Sub-Contractors shall not be considered as unsuitable material and shall be repaired or replaced by the Contractor at no additional cost to the Owner. Moisture content alone shall not be the determining factor as to the presence of unsuitable soil. Topsoil shall not be considered unsuitable regardless of thickness from the existing ground surface.

   a. Contractor shall perform densification and/or moisture conditioning to existing in-place soil that pumps during proof-rolling at the direction of the Owner's independent testing agency. Following densification and moisture conditioning efforts, soil that fails to pass subsequent proof-roll tests may be classified as Unsuitable Soil by the Owner's independent testing agency.

6. Backfill and Fill Materials: Imported fill or satisfactory soil materials.

7. Base Course Material: Type A aggregate base course meeting the requirements of Section 520 of NCDOT "Standard Specifications for Roads and Structures."

8. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

9. Bedding Material: #57 washed stone.

10. Drainage Fill: #57 washed stone.

11. Filtering Material/Stone: #57 washed stone.

12. Filter Sand: Washed, coarse to very coarse sand,1.0 mm to 2.0 mm particles.

13. Impervious Fill: Clayey or silty soil mixtures capable of compacting to a dense state with an maximum permeability of $1x10^{-4}$-cm/s compacted to at least 98% of the maximum dry density per ASTM D-698. ASTM D 2487 soil classification groups CH, CL, SC, MH, and ML; free of rock, brush, roots, and other organic material subject to decomposition.

B. PROCESSED AGGREGATE MATERIALS

1. Base Course Material: Type A aggregate base course meeting the requirements of Section 520 of NCDOT "Standard Specifications for Roads and Structures."

2. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

3. Bedding Material: #57 washed stone.

4. Drainage Fill: #57 washed stone.

5. Filtering Material: #57 washed stone.

6. Coarse Sand: Grain Size Distribution (ASTM C136-95A):

Sieve Size	Percent Passing
3/8"	100
#4	5-100
#8	85-97
#16	60-80
#30	10-20
#50	5-15
#100	0-5

C. ACCESSORIES

1. Drainage (Filter) Fabric: Nonwoven geotextile, specifically manufactured as a drainage geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:

   a. Grab Tensile Strength: 110 lbf (490 N); ASTM D 4632.
   b. Tear Strength: 40 lbf (178 N); ASTM D 4533.
   c. Puncture Resistance: 50 lbf (222 N); ASTM D 4833.
   d. Water Flow Rate: 150 gpm per sq. ft. (100 L/s per sq. m); ASTM D 4491.
   e. Apparent Opening Size: No. 50 (0.3 mm); ASTM D 4751.

31 20 00.03: EXECUTION

A. PREPARATION

1. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

2. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

3. Provide erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

4. Site Maintenance: The Contractor shall be responsible to take whatever measures are necessary to ensure reasonable accessibility to and on the construction site so that undue delays are avoided under normal weather conditions. These measures shall include, but not be limited to, the following:

   a. Maintaining the surface of the soils in a manner to promote drainage runoff and avoid ponding of water, especially prior to predicted rain events.
   b. Avoiding operation of temporary water sources or hoses in a manner which will cause unnecessary and repeated wetting of the site.
   c. Fill in severely rutted areas which are ponding water during the construction activities or after rain events with drainage fill material to assist drying and allow construction activities to continue.
   d. Provide drying of surface soils and soils intended for filling or backfilling as required to promote accelerated drying of those materials.
   e. After successful drying efforts or prior to predicted rain events, grade the areas back to a smooth condition to promote drainage runoff.
   f. Controlling vehicular traffic, both construction and personal on the site in a manner to prevent undue damage to soils whenever possible and practical.
   g. Providing temporary staging areas of crushed stone or other materials around the construction site which will better withstand the weather and traffic and keep the site accessible immediately or shortly after rain events.
   h. Provide de-watering equipment for any areas collecting water which may affect construction or soil densities under built areas.
   i. Any claims for weather related delays considered shall be considered with particular attention paid to the Contractor's efforts in regard to the above requirements

B. DEWATERING

1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

   a. 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.
   b. Install a dewatering system (such as well points) as needed to keep subgrades dry and convey groundwater away from excavations. Maintain until dewatering is no longer required.

3. Soft wet soils, if present at the surface, shall be dried in place by the Contractor prior to placing fill. Drying shall be accomplished by discing, plowing or other means necessary and shall be included in the Contractor's bid. Site soils are typical of the area and susceptible to loss of strength if they become wet, resulting in softening and rutting during construction. Site soils are extremely moisture sensitive, therefore, the Contractor shall take active and aggressive steps to dry soil materials wet of optimum to maintain construction progress through the work and to maintain access to and around the construction. The Contractor, at his option and cost may remove unstable, wet materials and replace with available fill materials in lieu of accomplishing soil drying procedures.

C. EXPLOSIVES

1. Explosives: The use of explosives is prohibited.

D. STABILITY OF EXCAVATIONS

1. Comply with local codes, ordinances, and requirements of authorities having jurisdiction to maintain stable excavations. Contractor is responsible for ensuring all excavation operations and other construction comply with applicable OSHA requirements. Contractor shall provide temporary shoring and bracing as needed to construct the proposed improvements and comply with the above requirements.

E. APPROVAL OF SUBGRADE PRIOR TO PLACING FILL OR OTHER IMPROVEMENTS

1. Notify Architect when excavations have reached required subgrade.

2. After stripping is complete the exposed subgrade shall be proofrolled with a fully loaded dual wheel tandem axial dump truck or similar construction equipment. Four passes shall be made in each orthogonal direction. The proof rolling operation shall be observed by the Architect. Should any area fail to tighten up after proofrolling and continue to rut and/or pump, the soil shall be densified and/or moisture conditioned as directed by the Owner's independent testing agency. Soil shall be densified with multiple passes of a heavy vibratory roller. Soil shall be moisture conditioned by scarifying and moistening or aerating and recompacting. Repeat proofrolling operations.

3. When Architect or Owner's independent testing agency determines that unforeseen unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

   a. Unforeseen additional excavation and replacement with suitable material approved by the Architect will be considered unsuitable material and will be paid by unit prices included in the Contract Documents. Refer to Division 01 Sections.

4. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect. Install french drains at design subgrade if directed by the Owner's independent testing agency and approved by the Architect.

F. UNAUTHORIZED EXCAVATION

1. Fill unauthorized excavation under foundations or wall footings by extending indicated bottom elevation of concrete foundation or footing to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position when acceptable to the Architect.

   a. Fill unauthorized excavations under other construction as directed by the Architect or the Owner's independent testing agency.

2. Where indicated widths of utility trenches are exceeded, provide stronger pipe, or special installation procedures, as required by the Architect.

G. STORAGE OF SOIL MATERIALS

1. Stockpile excavated materials acceptable for backfill and fill soil materials, including acceptable borrow materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent wind-blown dust.

    a. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

H. BACKFILL

1. Backfill excavations promptly, but not before completing the following:

    a. Acceptance of construction below finish grade.
    b. Removal of trash and debris from excavation.
    c. Removal of temporary shoring and bracing, and sheeting.
    d. Removal of objectionable materials, including rocks larger than acceptable size, from backfill soils.

I. UTILITY TRENCH BACKFILL

1. Place and compact bedding course on rock and other unyielding bearing surfaces and to fill unauthorized excavations. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

2. Pipe sleeves and concrete backfill trenches that carry below or pass under footings and that are excavated within 18 inches (450 mm) of footings. Place concrete to level of bottom of footings. Contact the Architect or the Owner's independent testing agency to coordinate details, procedures and possible alternatives.

3. Provide 4 inch (100 mm) thick concrete base slab support for piping or conduit less than 30 inches (750 mm) below surface of roadways. After installation and testing, completely encase piping or conduit in a minimum of 4 inches (100 mm) of concrete before backfilling or placing roadway base course.

4. Place and compact initial backfill of satisfactory soil material or base course material, free of particles larger than 1 inch (25 mm), to a height of 12 inches (300 mm) over the utility pipe or conduit.

    a. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.

5. Coordinate backfilling with utilities testing.

6. Fill voids with approved backfill materials as shoring and bracing, and sheeting is removed.

7. Place and compact final backfill of satisfactory soil material to final subgrade.

8. Install detectable warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

J. FILL

1. Preparation: Remove vegetation, topsoil, debris, wet, and unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placing fills.

    a. Plow strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing surface.

2. Obtain approval of subgrade as specified prior to placing fill.

3. Place fill material in layers to required subgrade elevations for each location listed below.

    a. In pond/basin embankments, use impervious fill.
    b. In all other areas use satisfactory excavated or borrow soil materials.

4. Following placement of fill, surfaces shall be proofrolled as described in the Field Quality Control section. The proofrolling operation shall be observed by the Owner's testing agency. Should any area fail to tighten up after proofrolling and continue to rut and/or pump, the soil shall be densified and/or moisture conditioned and recompacted. Repeat proofrolling operations.

5. Overbuild Deep Fill Slopes: Overbuild fill slopes in building or pavement areas that are taller than 6 feet and cut back to firm material following compaction. Fill slopes taller than 6 feet shall be overbuilt a sufficient distance to achieve required compaction at the design slope surface.

K. MOISTURE CONTROL

1. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.

    a. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
    b. Remove and replace, or scarify and air-dry satisfactory soil material that is too wet to compact to specified density.

        1) Stockpile or spread and dry removed wet satisfactory soil material.

L. COMPACTION

1. Place backfill and fill materials in layers not more than 6-8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

2. Place backfill and fill materials evenly to required elevations.

3. Percentage of Maximum Dry Density Requirements: Compact soil to not less than the following percentages of maximum dry density according to ASTM D698 Standard Proctor:

    a. Each layer of backfill or fill material shall be compacted to at least 95% of the standard Proctor Density (ASTM D-698). The final foot of fill beneath

pavements and floor slabs shall be compacted to at least 98% of the standard Proctor Density (ASTM D-698). Moisture content of the fill during placement shall be kept within 2% from the optimum moisture.

b. In pond/basin embankments, compact each layer of backfill or fill material at 95% of the standard Proctor Density (ASTM D-698). Moisture content of the fill during placement shall be kept within 3% of optimum.

M. GRADING

1. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

   a. Provide a smooth transition between existing adjacent grades and new grades.
   b. Cut out soft spots, fill low spots, and trim high spots to conform to required surface tolerances.

2. Site Grading: Slope grades to prevent ponding. Finish subgrades to required elevations within the following tolerances:

   a. All areas: Plus or minus 1.2 inches (0.10 foot).
   b. Pond Embankments: Construct embankment to an elevation 10% higher than the design height to allow for settling.

N. FIELD QUALITY CONTROL

1. Testing Agency Services: Allow testing agency to inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.

   a. Perform field in-place density tests using the Drive Tube Method (ASTM D 2937), the Sand Cone Method (ASTM D 1556), or the Nuclear Method (ASTM D 2922). If the Nuclear Method is used, the moisture content determined by the nuclear density shall be verified by performing one moisture content test per ASTM D 2216 for every five nuclear density tests.
   b. Perform a sufficient number of field in-place density tests to confirm compaction is being achieved but not less than one density test per 500 cubic yards of fill placed or one test per foot of fill thickness, whichever results in the greater number of tests.
   c. Trench Backfill: Perform at least one field in-place density test per 1 foot of thickness for every 100 linear feet of trench.
   d. Pond Embankments: At subgrade and at each compacted fill and backfill layer, perform at least one field in-place density test per 1 foot thickness for every 200 linear ft. or less of embankment. Monitor use of impervious fill as embankment materials.

2. When testing agency reports that subgrades, fills, or backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, recompact and retest until required density is obtained.

3. Proofrolling: Subgrade to receive fill and finish grade shall be proofrolled with a fully loaded dual wheel tandem axial dump truck or similar construction equipment. Four

passes shall be made in each orthogonal direction. The proofrolling operation shall be observed by the Owner's testing agency. Should any area fail to tighten up after proofrolling and continue to rut and/or pump, the soil shall be densified and/or moisture conditioned as directed by the Owner's independent testing agency. Soil shall be densified with multiple passes of a heavy vibratory roller. Soil shall be moisture conditioned by scarifying and moistening or aerating and recompacting. Repeat proofrolling operations.

4. Perform evaluation of off-site borrow soils and all soils to be used as embankment fill.

O. PROTECTION

1. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

2. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or lose compaction due to subsequent construction operations or weather conditions.

   a. Scarify or remove and replace material to depth directed by the Architect; reshape and recompact at optimum moisture content to the required density.

3. Settling: Where settling occurs during the Project correction period, remove finished surfacing, backfill with additional approved material, compact, and reconstruct surfacing.

   a. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

P. DISPOSAL OF SURPLUS AND WASTE MATERIALS

1. Disposal: Remove surplus soil and waste material, including unsatisfactory soil, excess topsoil, trash, and debris, and legally dispose of it off the Owner's property.

END OF SECTION

DIVISION 31

SECTION 31 25 10: EROSION CONTROL

31 25 10.01: GENERAL

A. RELATED DOCUMENTS

1. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

B. DESCRIPTION OF WORK

1. Work Included In This Section:

   a. Soil erosion and sedimentation control shall be provided by the Contractor for all areas of the site that are graded or disturbed by any construction operations and elsewhere as indicated on the Drawings or specified herein. Erosion control shall be as specified herein and as may be required by actual conditions and governing authorities.
   b. The Contractor shall have full responsibility for construction and maintenance of erosion control and sedimentation control facilities.
   c. The Contractor shall provide permanent or temporary ground cover as soon as possible, within 30 working days after completion of the rough grading of any specific area.

2. Related Work Specified Elsewhere:

   a. Site Clearing 31 10 00
   b. Earthmoving 31 20 00
   c. Site Drainage 33 40 00

C. PRODUCT HANDLING

1. Deliver seed fertilizer and other packaged materials in unopened original packages with labels legible and intact. Seed packages shall bear a guaranteed analysis by a recognized authority.

2. On-site storage of materials shall be kept to a minimum. Wet or damaged seed or other material shall be removed from the project site immediately.

31 25 10.02: PRODUCTS

A. MATERIALS

1. Lime: Ground Dolomitic limestone not less than 85% total carbonates and magnesium, ground so that 50% passes No. 100 mesh sieve and 90% - No. 20 mesh sieve. Coarser material will be acceptable provided the specified rates of application are increased proportionately on the basis of quantities passing No. 100 mesh sieve.

2. Commercial Fertilizer: A complete plant food containing nitrogen, phosphoric acid and potash in percentages as recommended by the State Department of Agriculture based on analysis of topsoil and soil required herein. Fertilizer must conform to all applicable State fertilizer laws; with availability of plant nutrients conforming to standards of the A.O.A.C. uniform in composition, dry, free flowing.

3. Superphosphate: Granular, dry, free flowing normal superphosphate (18%-20% P.O.); deliver in original bags.

4. Seed: Fresh seed guaranteed 95% pure with a minimum germination rate of 85% within one year of test. Temporary seeding shall be as follows:

   a. Annual Rye Grass at 150 lbs./acre minimum

5. P.L.S. (Purity x Germination): 100

   a. Tolerances shall be those tabulated in USDA Bulletin No. 480. Variety of grass for temporary grassing shall conform to Schedule or Sedimentation and Erosion Control Plan.

6. Mulch: Threshed straw of oats, wheat, or rye; free from seed or obnoxious weeds; or clean hay.

7. Matting: "Hold Gro" as manufactured by Gulf States Paper Corporation of heavy, twisted jute mesh. Opening between strands shall be approximately 3/4" square.

8. Wire Staples: 16 gauge steel wire, with minimum of 3" top and 4" long edge.

9. Gravel for Stone Filters: Crushed stone so that all stone will pass a 1-1/2" mesh screen and be retained on 3/4" mesh screen.

10. Silt Filter: "Mirafi 140" as manufactured by Celanese Corporation or approved equal.

11. Rip Rap: Provide rip rap where indicated on the Drawings and as approved by the Architect.

12. Emulsified Asphalt Binder: Asphalt "Tack" shall be rapid setting, RS or CRS designation, formulated for curing in less than 24 hours.

31 25 10.03: EXECUTION

A. EXISTING STRUCTURES AND FACILITIES

1. Existing structures, facilities, and water courses shall be protected from sedimentation.

2. The Contractor shall be responsible for the construction of necessary measures, and all costs shall be at the expense of the Contractor.

3. Items to be protected from sedimentation deposits shall include, but are not limited to, all downstream property, natural waterways, streams, lakes and ponds, catch basins, drainage ditches, roads, and natural buffer zones.

4. Control measures such as the erection of silt fences, barriers, dams, or other structures shall begin prior to any land disturbing activity. Additional measures shall be constructed as required during the construction.

5. All facilities installed shall be maintained continuously during construction until the disturbed areas are stabilized.

B. PROTECTIVE MEASURES

1. Protective measures shall conform to all State and Local requirements.

2. The following measures are listed as a guide for the protection of existing structures and facilities, and shall be included in the Contractor's expense where applicable. Design and construction of the measures shall be in accordance with all applicable laws, codes, ordinances, rules and regulations.

3. Silt Fence: Hog wire or wire mesh fastened to posts, and covered with "Mirafi 140" or equal.

4. Hay Bales: These shall be well bound and staked to the ground. Bales may be used in small ditches and swales.

   a. Berms and Diversion Ditches: These shall be graded channels with a supporting ridge on the lower side constructed across a sloping land surface. Diversion ditches and berms shall be planted in vegetative cover as soon as completed.
   b. Mulching: Mulching shall be used to prevent erosion and to hold soil and seed in place during the establishment of vegetation. Matting shall be used also where seeding may be easily eroded or disturbed.
   c. Matting: Matting shall be used for temporary stabilization during the establishment of seeded cover on areas such as grassed ditches, channels, long slopes, and steep banks.
   d. Tacking: Asphalt Binder shall be used to hold mulch and seed in place. Apply asphalt at 0.10 gal. per square yard (10 gal/100 ft.2).
   e. Build erosion control devices as required by governing agencies and or Drawings. Maintain until final inspection by Soil Conservation Inspector. When it is necessary to remove erosion control devices, return area to required profiles and condition.
   f. Other Measures: Other methods of protecting existing structures and facilities, such as vegetative filter strips, diversions, rip-rap, baffle boards, and ditch checks used for reduction of sediment movement and erosion, may be used at the option of the Contractor when approved by the appropriate State or local authorities.

C. STABILIZATION

1. Permanently protect stabilized areas prior to the removal of protective devices.

2. After the final establishment of permanent stabilization, remove temporary sediment control measures. Re-spread accumulated sediments and stabilize.

3. Permanently stabilize all areas disturbed by the removal and re-spreading operations immediately.

D. TEMPORARY SEEDING

1. Variety of seed, rate of application, and time for use of specific variety shall comply with schedule indicated on the plans or as called for herein.

2. Prepare soil by light discing to establish approximate permanent grade.

3. Remove large roots, debris, and stones, 1-1/2" in diameter or larger. After rough grading has been completed, and before topsoil is spread, apply soil conditioning materials as indicated on Plans and/or as required by state and local building codes and/or zoning authority.

4. Thoroughly scarify ground to a minimum depth of 4". Mix materials thoroughly with rototiller in 2 directions at right angles.

5. Where shown on drawings, apply topsoil. Take topsoil to a uniform grade so that all areas will drain properly. Compact lightly with a cultipacker before distributing grass seed.

6. Sow seed evenly with a mechanical spreader at the rate required for the specific variety. Roll with a cultipacker to cover seed, and water with a fine spray. Method of seeding and rate may be varied at discretion of Contractor on his own responsibility to establish a smooth, uniformly grassed area.

E. MULCHING, ANCHORING, NETTING, AND MATTING

1. Apply mulch anchoring with asphalt tacking, netting or matting to retain soil and grass.

2. Mulch areas by spreading a light cover of mulch over seeded area at the rate of not less than 85 lbs. per 1000 sq. ft.

3. On slopes greater than 3 to 1, mulch with matting or "Hold Gro". Pin matting to the ground with wire staples at 5' intervals immediately after seeding. Contractor may elect to use asphalt tack at 435 gal. per acre.

DIVISION 31

SECTION 31 31 16: SOIL TREATMENT

31 31 16.01: GENERAL

A. SCOPE

1. Provide complete protection against subterranean insect infestation with a soil poisoning treatment under slabs, adjacent areas, and where directed.

2. All work shall be performed by a NC licensed and bonded operator whose principal business is treatment of soil and eradication of insects and plant growth. Before acceptance of work, provide in writing and in acceptable form, warranty for a period of one year (five years at locations noted), warranting the treated areas against re-infestation. Upon notice by the Owner during warranty period, promptly provide such treatment as may be necessary for elimination of infestation.

31 31 16.02: PRODUCTS

A. MATERIALS

1. Use an emulsible concentrate insecticide for dilution with water, specially formulated to prevent infestation by termites such as BASF Termidor® termiticide concentrate. Fuel oil will not be permitted as a dilutent.

2. Other solutions may be used as recommended by Applicator and if acceptable to E.P.A. and local governing authorities. Use only soil treatment solutions which are not injurious to planting.

31 31 16.03: EXECUTION

1. At the time soil treatment is applied, soil shall be in friable condition with a sufficiently low moisture content to allow uniform distribution of chemical throughout soil adjacent to walls and other structures.

2. BASF Termidor® shall be applied according to manufacturer's recommendation to the building footing. No solution should be applied above the elevation of the bottom of the footing. Apply along complete building perimeter, all interior wall footings, and all expansion joints or construction joints in the floor slab.

DIVISION 32

SECTION 32 12 16: ASPHALT PAVING

32 12 16.01: GENERAL

A. DESCRIPTION OF WORK:

1. The type of work in this section include: proof rolling of prepared subbase provided under Section 32 11 16, furnishing, placing, and compacting asphaltic paving for patching areas affected by installation of new work as indicated on the drawings and as required by the scope of work.

B. RELATED SECTIONS:

Section 32 11 16 - Aggregate Base Course
Section 32 13 13 - Concrete Paving
Section 32 16 13 - Cast-In-Place Curbs and Gutters

C. REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3515 Hot-Mixed, Hot-Laid Bituminous Paving Mixtures – Current Edition

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION (NCDOT)

NCDOT Standard Specifications for Roads and Structures – Current Edition

D. EQUIPMENT

1. General

The bituminous plant shall be of such capacity to produce the quantities of bituminous mixtures required. Hauling equipment, paving machines, rollers, miscellaneous equipment, and tools shall be provided in sufficient numbers and capacity and in proper working condition to place the bituminous paving mixtures at a rate equal to the plant output.

2. Mixing Plants

Mixing plants shall conform to the requirements of NCDOT Section 610-5.

E. WEATHER LIMITATIONS

1. Unless otherwise directed, bituminous courses shall not be constructed when temperature of the surface of the existing pavement or base course is below 40 degrees F.

F. PROTECTION OF PAVEMENT

1. After final rolling, no vehicular traffic of any kind shall be permitted on the pavement until the pavement has cooled to 140 degrees F.

G. GRADE AND SURFACE-SMOOTHNESS REQUIREMENTS

1. Finished surface of bituminous courses, when tested as specified below and in paragraph ACCEPTABILITY OF WORK, shall conform to gradeline and elevations shown and to surface-smoothness requirements specified.

2. Plan Grade

The grade of the completed surface shall not deviate more than 0.05 foot from the plan grade.

3. Surface Smoothness

When a 12-foot straightedge is laid on the surface parallel with the centerline of the paved area or transverse from crown to pavement edge, the surface shall vary not more than 1/4 inch from the straightedge.

H. GRADE CONTROL

1. Lines and grades shall be established and maintained by means of line and grade stakes placed at site of work by the Contractor. Elevations of bench marks used by the Contractor for controlling pavement operations at the site of work will be designated on the plans. Finished pavement elevations shall be established and controlled at the site of work by the Contractor in accordance with bench mark elevations furnished on the plans.

I. SUBMITTALS:

1. Material Certificates:

a. Provide copies of material certificates signed by material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

2. Test Reports:

a. Within 10 days of taking specimens, submit notarized reports documenting thickness and density of base and surface courses as specified herein. Reports shall conform to the requirements of the specified test standards.

32 12 16.02: PRODUCTS

A. MATERIALS: The following products and specifications are intended to suggest quality requirements of products to be utilized in the construction of bituminous paving surfaces. Provide equal materials and specifications of products of State having jurisdiction.

1. Herbicide Treatment: Amino Triazone or approved equal shall be mixed with water in a concentration sufficient to prevent growth of grass and weeds for a period of two years.

B. BITUMINOUS HOT MIX

1. Shall consist of coarse aggregate, fine aggregate, mineral filler, bituminous material, and approved additives, if required, of the qualities and in the proportions specified in all applicable sections of NCDOT "Standard Specifications for Roads and Structures", and by the American Association of State Highway Transportation Officials (AASHTO).

2. Prime Coating: Surfaces of previously constructed base course shall be sprayed with a coat of bituminous material conforming to Grade MC-30 or RC-30 of NCDOT Section 600.

3. Tack Coat: Comply with NCDOT, Section 605-8 hot laid asphalt concrete surface course. Asphalt grade shall be RS-1H. Asphalt for tack coat shall be at not less than 90°F nor more than 145°F during application.

C. BITUMINOUS CONCRETE MIXES FOR ROADS AND PARKING

1. Bituminous concrete binder course shall be NCDOT Type 119.0C, conforming to NCDOT Section 640. Bituminous concrete surface course shall be NCDOT Type S-9.5C, conforming to NCDOT Section 645.

32 12 16.03: EXECUTION

A. BASE COURSE CONDITIONING

1. The surface of the base course will be inspected for adequate compaction and surface tolerances specified in Section 32 11 16 AGGREGATE BASE COURSE.

B. PREPARATION OF BITUMINOUS CONCRETE SURFACE COURSE, ROADS AND PARKING

1. Bituminous concrete surface course shall be NCDOT Type S-9.5C, conforming to NCDOT Section 645. Bituminous concrete binder course shall be NCDOT Type I-19.0C, conforming to NCDOT Section 640.

C. STORAGE OF BITUMINOUS PAVING MIXTURE

1. Storage shall conform to the applicable requirements of ASTM D 3515; however, in no case shall the mixture be stored for more than 4 hours.

D. TRANSPORTATION OF BITUMINOUS MIXTURE

1. Transportation from paving plant to site shall be in trucks having tight, clean, smooth beds lightly coated with an approved releasing agent to prevent adhesion of the mixture to the truck bodies. Excessive releasing agent shall be drained prior to loading. Each load shall be covered with canvas or other approved material of ample size to protect mixture from weather and to prevent loss of heat. Loads that have crusts of cold, unworkable material or that have become wet will be rejected. Hauling over freshly placed material will not be permitted.

E. PRIME COATING

1. Surfaces of previously constructed base course shall be sprayed with a coat of bituminous material conforming to Grade MC-30 or RC-30 of NCDOT Section 600.

F. PLACING

1. Bituminous courses shall be constructed only when the base course or existing pavement has no free water on the surface. Bituminous mixtures shall not be placed without ample time to complete spreading and rolling during daylight hours, unless approved satisfactory artificial lighting is provided.

G. COMPACTION OF MIXTURE

1. Rolling shall begin as soon after placing as the mixture will bear a roller without undue displacement. Delays in rolling freshly spread mixture will not be permitted. After initial rolling, preliminary tests of crown, grade, and smoothness shall be made by the Contractor. Deficiencies shall be corrected so that the finished course will conform to requirements for grade and smoothness specified herein. Places inaccessible to rollers shall be thoroughly compacted with hot hand tampers.

2. Surface Requirements: The finished surface shall be such that it will not vary more than 1/4 inch in 10 feet from the levels indicated. Any irregularity of the surface exceeding the above limits shall be corrected. Depressions which may develop after the initial rolling shall be remedied by loosening or removing the mixture and adding new material to bring the areas to a true surface. No skin patching shall be done. Such portions of the completed pavement as are defective in surface compaction or in composition, or that do not comply with all other requirements of these specifications, shall be taken up and replaced with suitable mixture, properly laid in accordance with these specifications and at the expense of the Contractor.

3. Correcting Deficient Areas

Mixtures that become contaminated or are defective shall be removed to the full thickness of the course. Edges of the area to be removed shall be cut so that sides are perpendicular and parallel to the direction of traffic and so that the edges are vertical. Edges shall be sprayed with bituminous materials conforming to NCDOT Section 605. Fresh paving mixture shall be placed in the excavated areas in sufficient quantity so that the finished surface will conform to grade and smoothness requirements. Paving mixture shall be compacted as specified in NCDOT Sections 635, 640 and 645. Skin patching of an area that has been rolled shall not be permitted.

H. JOINTS

1. General

Joints between old and new pavements, between successive work days, or joints that have become cold (less than 175 degrees F) shall be made to insure continuous bond between the old and new sections of the course. All joints shall have the same texture and smoothness as other sections of the course. Contact surfaces of previously constructed pavements coated by dust, sand, or other objec-

tionable material shall be cleaned by brushing or shall be cut back as directed. The surface against which new material is placed shall be sprayed with a thin, uniform coat of bituminous material conforming to NCDOT Section 605. Material shall be applied far enough in advance of placement of a fresh mixture to insure adequate curing. Care shall be taken to prevent damage or contamination of the sprayed surface.

I. FIELD QUALITY CONTROL:

1. General: Test in -place asphalt concrete courses for compliance with requirements for thickness and surface smoothness. Repair or remove and replace unacceptable paving as directed by Architect.

2. Thickness: In-place compacted thickness will not be acceptable if exceeding following allowable variation from required thickness:

   Base Course: ½", plus or minus.
   Surface Course: 1/4", plus or minus.

3. Check surface areas at intervals as directed by Architect.

J. PROTECTION:

1. Protection of Pavements: After completion of the pavement, no vehicular traffic of any kind shall be permitted on the pavement until it has set sufficiently to prevent rutting or other distortion. Damaged areas shall be repaired at no cost to the Owner.

END OF SECTION 32 12 16

DIVISON 32

SECTION 32 13 00: ROADS AND WALKS

32 13 00.01: GENERAL

A. SCOPE

1. Furnish all labor, material and equipment necessary to complete all roads and walks indicated on the drawings and specified herein including:

   a. Asphalt
   b. Concrete walks, stairs, ramps, terraces and pads
   c. Concrete curbs, gutter and driveway entrances

B. GENERAL

1. Work of this heading consists of new construction and/or removal and replacement of a flexible base course and a hot mix asphaltic concrete surface course during installation of water and sewer utility lines. The finished surface course shall meet the requirements for line, grade, and materials as defined by conditions prior to construction, local authority requirements, Drawings and Specifications.

32 13 00.02: PRODUCTS

A. PAVING MATERIALS

1. Base course shall conform to applicable Section(s) of the Standard Specifications of the State Department of Transportation. Thickness of the base course shall be as indicated on the drawings.

2. Prime coat shall be a medium curing, cut-back liquid asphalt conforming to Section 600 of the Standard Specifications of the N.C. Department of Transportation.

3. Surface course shall be Type I-2 conforming to Section 660 of the Standard Specifications of the N.C. Department of Transportation. Thickness of the surface course shall be as indicated on the drawings.

4. Parking lines, arrows, and symbols shall be painted with factory mixed, quick drying, non-bleeding, chlorinated rubber base paint conforming to TT-P-115C, Type III. Color will be selected by the Architect.

B. CONCRETE MATERIALS

1. Concrete for walks, stairs, etc. shall have a 28-day compressive strength of 3,000 psi.

2. Concrete for curbs, gutters and driveway entrances shall have a 28-day compressive strength of 3,000 psi and shall be reinforced as shown on the drawings.

3. All concrete materials shall conform to all applicable requirements of DIVISION 03.

4. "BOMANITE/BOMACRON " (trade name) Paving will be addressed in Section 32.

32 13 00.03: EXECUTION

A. ASPHALT PAVING

1. The roadbed shall be stripped of all vegetation, roots, etc., excavated and shaped in conformity with the typical sections and to the lines and grades indicated on the Drawings. The subgrade shall then be compacted as specified or proofrolled with suitable equipment to determine the stability of the subgrade. If soft or unstable areas in the opinion of the on-site inspector or Architect/Engineer are encountered during this operation, they shall be removed and replaced with 6 inch lifts of compacted granular material from either an approved on-site or off-site source. The unsuitable material removed shall be deposited and graded within an area identified by the Architect/Engineer on the project site or its immediate surroundings.

2. All areas of the prepared sub-base to be used for supporting the pavement shall be proofrolled with a heavily loaded, single-axle dump truck. Proofrolling shall extend at least 5 feet beyond the pavement perimeter where practicable. Notify the Architect/Engineer of all areas that rut or deflect and fail to tighten up with repeated passes. Do not begin base material placement until such conditions have been corrected.

3. In all pavement areas the upper 12" of the subgrade shall be the equivalent of a well compacted structural fill compacted to 95% of Modified Proctor maximum dry density.

4. Check compacted sub-base for conformity with elevations and section immediately before placing base material. Remove loose and foreign material from surface of sub-base. Sufficient sub-base shall be prepared in advance to ensure satisfactory prosecution of the work.

5. Base material deposited upon the prepared subgrade shall be spread and shaped the same day. Compaction shall begin immediately using the proper equipment selected by the Contractor. Tests shall be made by the Contractor to assure the proper density control.

6. Place base material in compacted layers not more than 4 inches thick. Spread, shape, and compact all base material deposited on the subgrade during the same day. Compact base course material to not less than 95% of maximum density: ASTM 1557-70 Method D.

7. Uniformly apply prime coat over compacted base course with recommendations of A.1.MS13. Apply enough material to penetrate and seal, but not flood the surface. Allow to cure and dry as long as required to attain penetration and in no case less than 24 hours unless otherwise acceptable to the Architect. Blot excess asphalt with enough sand before paving.

8. Set frames of subsurface structures to final grade and surround with a ring of compacted asphalt base prior to paving.

9. Place surface course mixture on the approved prepared surface, spread and strike off using paving machine. Spread mixture at a minimum temperature of 225°F.

The air temperature, when placing the asphaltic mixture, shall be 40°F and rising. The Contractor shall supply copies of all pavement material invoices indicating conformance with specifications to the Architect upon request. Inaccessible and small areas may be placed by hand. Place each course at thickness so that when compacted, it will conform to the indicated grade, cross-section, finish thickness, and density indicated.

10. Place surface course to within one inch below top of subsurface structure frames. Slope paving to grade, and compact by hand tamping. Adjust frames to proper position to meet paving.

11. Begin rolling operations as soon after placing when the mixture will bear weight of the roller without excessive displacement. Rolling shall be accomplished using a two axle tandem roller weighing not less than ten tons. Rollers shall move at a slow but uniform speed with the drive wheels nearest the paver and shall be maintained in continuous operation. Do not permit heavy equipment, including rollers to stand on finished surface before it has thoroughly cooled or set. Compact mixture with hot hand tampers or vibrating plat compactors in areas inaccessible to rollers. Start rolling longitudinally at extreme lower side of section and proceed toward center of pavement. Roll to slightly different lengths on alternate roller runs. Do not roll centers of section first under any circumstances. Rolling shall continue until all roller marks are eliminated.

12. Asphalt thicknesses are compacted measurements. In-place paving thicknesses shall be verified by core samples taken at random locations, if requested by the Architect. Any evidence of inadequate paving shall be corrected by the Contractor without additional expense to the Owner. The Contractor shall also be responsible for replacing materials taken from core sampling at no additional cost to the Owner, regardless of satisfactory or unsatisfactory results.

13. Remove and replace defective areas. Cut-out and fill with fresh, hot asphalt concrete. Compact, by rolling to specified surface density and smoothness. Remove deficient areas for full depth of course. Cut sides perpendicular and parallel to direction with edges vertical. Apply tack coat to exposed surfaces before placing new asphalt concrete mixture.

14. Contact surface of curb and gutter, drainage structures and other concrete appurtenances shall be painted with a thin, uniform coating or bituminous material prior to the mixture being placed against them. Soft and yielding base material shall be removed and replaced with suitable base material prior to placing the asphaltic concrete surface course.

15. After completion of paving operations, clean surfaces of excess or spilled asphalt materials to the satisfaction of the Architect. After final rolling, do not permit vehicular traffic on asphalt concrete pavement until it has cooled and hardened and in no case sooner than 6 hours. Provide barricades and warning devices as required to protect pavement and the general public. Cover openings of structures in the area of paving until permanent coverings are placed.

16. Do not begin marking asphalt paving until obtaining approval of the Architect. Sweep surface with power broom supplemented by hand brooms to remove loose material and dirt. Apply not less than two separate coats of paint with mechanical

equipment in accordance with manufacturer's recommended rates. Provide uniform straight edges.

17. Final clean-up of the site shall be done by the Contractor to remove from the site asphalt debris, base material, and miscellaneous material.

18. Furnish the Owner with a one year written warranty covering labor, material, and maintenance for new asphalt paving and base work.

B. TRENCHING Of EXISTING ASPHALTIC PAVING

1. Before trenching in paved areas the Contractor shall cut through the pavement in a straight line along the sides of the proposed trench so that the pavement may be removed and the trench may be dug without damage to the adjacent pavement. During construction suitable precautions shall be taken to protect the pavement edges and surfaces and minimize damage.

2. As soon as the pipe has been installed the trench shall be backfilled and a temporary pavement patch shall be provided in paved areas. The temporary pavement shall consist of at least six (6) inches of compacted stone base followed by single surface treatment which will protect the base, prevent "pot holes" or "chuck holes", and provide a reasonably smooth pavement surface until the permanent patch is made.

3. The permanent pavement patch shall not be made until the job is nearing completion in order to allow maximum time for any further settlement.

4. Pavement replacement shall extend a minimum of one foot beyond the trench line, and shall include replacement of all defective pavement resulting from the Contractor's operations, regardless of whether caused by blasting, trenching, equipment operation, cave-in or other cause. Where the cut edge of payment is less than one foot from the edge of the trench, or has been disturbed during construction, the Contractor shall cut through and remove existing pavement, the inside edges of the existing asphalt shall be coated with a thin application of liquid bituminous material.

5. The Contractor shall be responsible for maintaining temporary patches during construction and shall promptly repair any defects. Upon completion of the work the paved surfaces shall be left in as good or better condition than before the start of construction.

C. CONCRETE WALKS, RAMPS AND PADS

1. The subgrade shall be excavated and shaped to line, grade, and cross-section prior to the concrete being placed. The subgrade shall be made to the required depth and width that will permit the installation and bracing of forms.

2. All soft and yielding material shall be removed and replaced with acceptable material, which shall then be compacted as required by other sections of these Specifications.

3. Forms for sidewalks shall be of wood or metal of a section satisfactory to meet the

design conditions. The reinforcing, if required, shall be placed in position as shown on the Drawings. Allow forms to remain in place for a minimum of 24 hours after concrete placement.

4. Do not place concrete until subgrade and forms have been checked for line and grade. Moisten subgrade to produce a uniform dampened condition at time concrete is placed.

5. Finish concrete surface variations shall be not more than 1/8 inch under a ten foot long straightedge. Provide concrete work of this Section with a wood float finish, unless otherwise specified. The edges of all concrete surfaces shall be rounded with an edging tool having a radius of 1/4 inch.

6. Sections of curb and sidewalks that are damaged during construction and before final acceptance shall be replaced in a satisfactory manner by the Contractor at no expense to the Owner. Vehicular traffic shall not be allowed in the area of the curbs during the curing process or in less than five days after placement.

7. After the curing process has been completed, concrete walks and curbs shall be backfilled with suitable material and then tamped and compacted with metal or wood tamps. The finish grade shall be made smooth with the top of the concrete surface. All excess material and debris shall be removed from the site.

8. Sidewalks, paving, curb and gutter shall have a broom finish.

   a. Contraction joints in walks and ramps shall be provided in pattern shown on plans. Contraction joints shall be produced by cutting the joints in the concrete with an approved tool after floating has been completed. Joints shall be one inch deep. Edges of joints shall be smoothed to approximately a 1/4 inch radius.
   b. If no pattern of joints is shown or noted, the surface of sidewalks and paving shall be divided into blocks by use of a grooving tool. Grooves shall be so placed as to cause expansion joints to be placed at a groove line. The grooves shall be spaced a maximum of eight feet apart and the blocks shall be rectangular in shape. Pattern to be approved by the Architect. The grooves shall be cut to a depth of not less than one inch. The edges of the grooves shall be placed in other flat concrete sections so as to produce the same effect as in the sidewalks.
   c. Expansion joints in walks and ramps shall be placed where shown on the drawings. Expansion joint material shall be 1/2 inch thick. Expansion joint material shall be securely fastened in place so that it will not be disturbed when concrete is placed against it. Joint filler shall extend full depth of joint and top shall be 1/4 inch below finish surface of walk.
   d. Expansion joints not shown will be formed by 1/2 inch pre-molded expansion joint filler and shall be placed in all sidewalks, curbs and paving at intervals of not over 20 feet unless otherwise noted. All pre-molded expansion joint filler shall be cut to full width and length of the proposed construction and shall extend to within 1/2 inch of the top or finish grade. Expansion joint filler of the thickness indicated shall be installed between concrete sidewalks and fixed structures and adjacent concrete sections.

9. Walks, ramps and pads shall have a steel trowel and broom or brush finish, and shall be scored as indicated on the drawings. (Steel trowel areas only as approved in writing by Architect or specifically noted on drawing(s).

10. Walks, ramps and pads shall be damp cured for a minimum of seven days. After finishing has been completed, they shall be protected from pedestrian traffic for a minimum of 3 days.

11. Concrete surfaces shall be protected from the sun by acceptable means of curing. The curing process shall begin as soon as marring of the new concrete will not occur. When a water cure is used the concrete shall be kept continuously wet for 72 hours. If the Contractor elects to use a manufactured curing membrane, it shall be applied under pressure by mechanical sprayers at the rate recommended by the manufacturer, but in no case less than one gallon to each 150 square feet.

D. CONCRETE CURBS, GUTTERS AND ENTRANCES

1. Joints shall be provided in concrete curbs and gutters at uniform intervals of 10 feet. Joints between sections shall be formed with steel templates 1/2 inch thick, of width and depth of section, and at least 2 inches longer than depth of section. Templates shall be left in place until concrete has set sufficiently to hold its shape, but shall be removed while forms are still in place.

2. Preformed expansion joint material shall be provided at a maximum spacing of 40 feet on centers. Extend expansion joint material full depth of concrete section and cut to fit surface contour.

3. Edges of curb and gutter shall be finished with an approved edging tool. Forms shall be left in place until they can be removed without injury to the work. Upon removal of forms, all normally exposed surfaces shall be rubbed down to a smooth and uniform finish. Damaged sections shall be removed and replaced at the Contractor's expense. Plastering of damaged areas will not be permitted.

4. Curbs and gutters shall receive a smooth brush finish and shall be damp cured for a minimum of seven days. After finishing has been completed, they shall be protected against damage and pedestrian traffic for a minimum of three days.

5. The concrete curb and gutter may be constructed using an automatic curb machine producing the template shown on the Drawings. The Contractor shall submit the mix design for approval prior to beginning work. Concrete used in extruded curb machines shall have no slump.

DIVISION 32

SECTION 32 13 13: CONCRETE PAVING

32 13 13.01: GENERAL

A. DESCRIPTION OF WORK

1. Exterior sidewalks and exterior concrete slabs are provided under this section.

B. RELATED SECTIONS

1. Section 03 30 00 - Concrete Work for additional products, quality control standards, etc.

C. QUALITY ASSURANCE

1. Comply with applicable requirements of Division 32 sections and NCDOT Section 700 for submittals, concrete materials, testing, mixing, placing, and curing, except as herein specified.

D. JOB CONDITIONS

1. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize barricades, warning signs, and warning lights as required.

32 13 13.02: PRODUCTS

A. MATERIALS

1. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. Coat forms with a non-staining form release agent that will not discolor or deface surface of concrete.

2. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A 185. Furnish in flat sheets, not rolls, unless otherwise acceptable to Architect. (Provide only in areas as shown on drawings).

3. Reinforcing Bars: Deformed steel bars, ASTM A 615, Grade 60.

4. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.

5. Metal Expansion Caps: Furnish for one end of each dowel bar in expansion joints. Design caps with one end closed and a minimum length of 3" to allow bars movement of not less than 1", unless otherwise indicated.

6. Liquid-Membrane Forming Curing Compound: Complying with ASTM C 309, Type I, Class A unless other type acceptable to Architect. Moisture loss not more than 0.055 gr./sq. cm. when applied at 200 sq. ft./gal. Provide one of the following products or approved equal: (1) "Masterseal" - Master Builders, (2) "Ecocure" - Euclid Chemical Co., (3) Cure & Seal - Conspec.

B. CONCRETE MIX, DESIGN, AND TESTING

1. Comply with requirements of applicable Division 3 sections for concrete mix design, sampling and testing, and quality control, and as herein specified. Design mix to produce normal-weight concrete consisting of Portland cement, aggregate, air-entraining admixture, and water to produce the following properties:

   a. Compressive Strength: 3,600 psi, or as indicated on the Drawings, in 28 days unless indicated otherwise on drawings and details.
   b. Slump Range: 3" to 5" for other concrete not having specific slumps given under this section.
   c. Air Content: 5% to 7% for 3/4" aggregate.
   d. Water-Cement Ratio: 45 maximum (5.1 gallons per sack of concrete).

32 13 13.03: EXECUTION

A. SURFACE PREPARATION

1. Remove loose material from compacted subbase surface immediately before placing concrete. Proof-roll prepared subbase surface to check for unstable areas and need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving, as directed by soils engineer.

B. FORM CONSTRUCTION

1. Set forms to required grades and lines, rigidly braced and secured. Install sufficient quantity of forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement. Clean forms after each use and coat with form release agent as often as required to ensure separation from concrete without damage.

C. REINFORCEMENT

1. Locate, place, and support reinforcement as specified in Division 3 sections, unless otherwise indicated.

D. CONCRETE PLACEMENT

1. Moisten subbase if required 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.

2. Place concrete using methods which prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices. Deposit and spread concrete in a continuous operation between transverse joints, as far as possible. If interrupted for more than ½-hour, place a construction joint.

E. JOINTS

1. General: Construct expansion, weakened-plane (contraction), and construction joints true-to-line with face perpendicular to surface of concrete. Construct transverse joints at right angles to the centerline, unless otherwise indicated.

2. Weakened-Plane (Contraction) Joints: Provide weakened-plane (contraction) joints at 10' intervals unless otherwise indicated. Construct weakened-plane joints for a depth equal to at least 1/4 concrete thickness, as follows:

   a. Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer unless otherwise specified.

3. Construction Joints: Place construction joints at end of placements and at locations where placement operations are stopped for a period of more than ½-hour, except where such placements terminate at expansion joints.

4. Expansion Joints: Provide premolded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks and other fixed objects, unless otherwise indicated. Locate expansion joints at 20' O.C., unless otherwise indicated. Extend joint fillers full-width and depth of joint and not less than ½" or more than 1" below finished surface.

5. Fillers and Sealants: Comply with the requirements of applicable Division-7 sections for preparation of joints, materials, installation, and performance.

F. CONCRETE FINISHING

1. After striking-off and consolidating concrete, smooth surface by screeding and floating. Adjust floating to compact surface and produce uniform texture. After floating, test surface for trueness with a 10' straightedge. Distribute concrete as required to remove surface irregularities and refloat repaired areas to provide a continuous smooth finish. After completion of floating and troweling when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:

   a. Broom finish, by drawing a fine-hair broom across concrete surface, perpendicular to line of traffic.

2. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Architect.

G. CURING

1. Protect and cure finished concrete paving, complying with applicable requirements of Division 3 sections. Use membrane- forming curing and sealing compound or approved moist-curing methods.

H. REPAIRS AND PROTECTIONS

1. Repair or replace broken or defective concrete, as directed by Architect.

2. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

3. Sweep concrete pavement and wash free of stains, discolorations, dirt and other foreign material just prior to final inspection.

END OF SECTION

DIVISION 32

SECTION 32 31 13: CHAIN LINK FENCING

32 31 13.01: GENERAL

A. DESCRIPTION

This section covers the installation of chain link fence and gate materials as shown on the plans. The Contractor shall furnish all labor, material, equipment, supplies and cleanup to complete the fence installation as specified herein.

B. RELATED WORK

1. Chain Link Fence Manufacturers Institute (CLMI) Standards:
    a. Industrial Steel Specification for Fence-posts, Gates, and Accessories
2. Standards for Chain Link Fence Installation
3. Federal Specifications:
    a. FS RR-F-191/A Fencing, Wire and Post, Metal (Chain Link Fence Fabric)
4. Any reference to standard specifications refers to the most current published date of the following specifications unless noted.

C. SUBMITTALS

Shop drawings covering design, complete layout and installation details for the work of this section.

32 31 13.02: PRODUCTS

A. MATERIALS

1. All materials shall be new and be furnished by the Contractor in accordance with the following requirements.

B. FRAMEWORK

1. Posts, rails, braces and fittings shall be hot-dip galvanized, 2.0 oz/ sq. ft. coating.
    a. Line Posts: 2.50-inch OD Schedule 40 steel pipe; steel "H" columns, nominal weight 4.1 lb/ft, or 2.25 x 1.70-inch steel "C" Sections, nominal weight 2.73 lb/ft.
    b. Terminal and Gate Posts: 3.0-inch OD Schedule 40 steel pipe; or 3.5 x 3.5-inch steel roll formed sections, nominal weight 5.14 lb/ft; except that double-leaf gate posts shall be 4.00-inch OD Schedule 40 steel pipe or larger as recommended by the fence manufacturer.

c. Top and Brace Rails: 1.625-inch OD Schedule 40 steel pipe or 1.625 x 1.25-inch steel channel sections with suitable couplings.
d. Gate Frame: 2.0-inch OD Schedule 40 steel pipe welded at corners or assembled with fittings.
e. Post Tops: Cast steel or malleable iron combination type with barbed wire extension arms; tops shall be designed to exclude moisture from posts and to hold top rail.
f. Fittings: Pressed steel or malleable cast iron.
g. Extension Arms: Cast steel designed to hold three strands of barbed wire at a 45-degree angle with the top strand 12 inches above the fence fabric and 12 inches out from the fence line.
h. Truss Rod: 0.375-inch OD.

2. Fabric:

a. 9 gage steel wire woven in 2-inch mesh, 0.40 oz/sq. ft. aluminum coated, knuckled at one selvage and twisted at the other.
b. 11 gage (.120" thick) core wire vinyl-coated to an 8 gage (.162" thick) finish, color to be chosen by the Architect.

3. Tension Wire:

a. 7 gage spiraled or crimped steel wire, 0.40 oz/sq. ft. aluminum coated.

4. Barbed Wire (if applicable):

a. Three 12 gage steel stranded line wires with 14 gage steel wire barbs in a four-point pattern spaced 5 inches on center, 0.3 oz/sq. ft. aluminum coating.

5. Gate Hardware:

a. Fork-type with gravity drop, center gate stop and drop rod, mechanical keepers and two 180 degree gate hinges per leaf.

6. Footing Concrete:

a. Class B, 2500 psi 28-day compressive strength.

C. INSTALLATION

1. Line posts shall be evenly spaced at intervals not exceeding 8 feet and in true alignment with the designed fence line. All posts shall be set plumb at least 36 inches deep in a concrete footing. Footings shall not be less than 9-inch diameter for line posts and 12-inch diameter for terminal and gateposts. Top of footings should be crested slightly to shed water.

2. Top Rails shall pass through line post tops to form a continuous brace. Corner posts shall be provided with a center brace rail installed midway between the top rail and ground level extending to the first line post and securely trussed diagonally from the line post back to the terminal post. All rails shall be securely fastened to posts.

3. Fence Fabric shall be stretched between terminal posts or at maximum intervals of 100 feet; whichever is less. The bottom of the fabric shall be positioned 2 inches

above finish grade. Fabric shall be fastened to the top rail, line posts and branches with wire ties spaced not more than 15 inches on center and attached to terminal and gate posts with tension bars and tension chips. Tension wire shall be stretched along fabric bottom six inches above finish grade. Fabric shall be attached to tension wire with tie wires spaced 24 inches on center.

4. Extension Arms shall be installed with the arms inclined outward. Barbed wire shall be properly stretched and securely fastened to the extension arm.

5. Gates shall be installed with fabric and barbwire overhang to match fence. Fabric shall be securely fastened to the frame. Diagonal truss rods shall be provided as required to prevent sag or twist. Gates shall be properly installed with all hardware and accessories to ensure that they open and close freely without binding. A concrete footing at least 12 inches deep and drop rod retainer shall be provided at the center of double gate openings.

DIVISION 32

SECTION 32 92 00: SEEDING, SODDING AND LANDSCAPING

32 92 00.01: GENERAL

A. SUMMARY

1. Section Includes:

   a. Seeding, sodding and landscape planting:

      1) Temporary seeding.
      2) Soil preparation.
      3) Lawn-type seeding.
      4) Plants and planting.
      5) Maintenance of new and transplanted materials.
      6) Replacement of dead or impaired materials at the end of the first growing season.

2. Related Sections include but are not necessarily limited to:

   a. Section 31 22 19 - Finished Grading.
   b. Section 31 25 00 - Soil Erosion and Sediment Control.

B. QUALITY ASSURANCE

1. Referenced Standards:

   a. American Standard for Nursery Stock (ASNS).
   b. Standard Methods of the Association of Official Agricultural Chemists.
   c. United States Department of Agriculture, (USDA):

      1) Federal Seed Act.

2. Perform all work in accordance with state and local specifications and requirements and in accordance with Federal rules and regulations.

C. SUBMITTALS

1. Shop Drawings:

   a. Product technical data including:

      1) Acknowledgement that products submitted meet requirements of standards referenced.
      2) Manufacturer's installation instructions.
      3) Signed copies of vendor's statement for seed mixture required, stating botanical and common name, place of origin, strain, percentage of purity, percentage of germination, and amount of Pure Live Seed (PLS) per bag.

4) Type of herbicide to be used during first growing season to contain annual weeds and application rate.

b. Certification: Certify each container of seed delivered will be labeled in accordance with Federal and State Seed Laws and equals or exceeds Specification requirements.

D. DELIVERY, STORAGE, AND HANDLING

1. Furnish seed in sealed standard containers labeled with producer's name and seed analysis. Remove from the site seed which has become wet, moldy, or otherwise damaged in transit.

2. Furnish fertilizer uniform in composition, free flowing and suitable for application with approved equipment, delivered to site in bags or other containers, each fully labeled and bearing the name, and warranty of the producer.

32 92 00.02: PRODUCTS

A. MATERIALS

1. Seed:

a. Amount: A minimum of 4 lbs per 1,000 square feet.
b. The seed quality requirements for this project are as follows:

1) Seed shall be entirely free from bulblets or seed of Bermuda Grass, Johnson Grass, Nutgrass, Sandbur, Wild Onion, Wild Garlic, Witchweed, and Crotalaria.
2) Seed shall not contain more than 2%, singly or collectively, of crop seed other than the kind or kinds of seed specified.
3) The limits of restricted noxious weed seed which are specified for the various kinds of seed refer to the number per pound, singly or collectively, of cocklebur, blessed thistle, wild radish, Canada thistle, Corncockle, field bindweed, quackgrass, giant foxtail, dodders, dock, horsenettle, bracted plantain, buckhorn plantain, sicklepod, partridge pea, spurred anoda, velvetleaf, ragged robin, or wild mustard. However, in no case shall the number of cocklebur, blessed thistle, sicklepod, partridge pea, spurred anoda, or velvetleaf exceed 4 seeds of each per pound; the number of corncockle shall not exceed 10 seeds per pound; the number of wild radish shall not exceed 12 seeds per pound, the number of Canada thistle, field bindweed, ragged robin, or Texas panicum shall not exceed 27 seeds per pound; nor shall the number of quackgrass, giant foxtail, dodder, dock, horsenettle, bracketed plantain, buckhorn plantain, or wild mustard exceed 54 seeds of each per pound.

c. Provide the following Lawn type seed mixture according to planting date:

August 1 - June 1	% by Weight
KY 31 Tall Fescue	80
Kentucky Bluegrass	10
Hard Fescue	10

May 1 - September 1	% by Weight
KY 31 Tall Fescue	65
Kentucky Bluegrass	10
Hard Fescue	10
German or Browntop Millet	15

d. Provide the following temporary seed mixture according to planting date:

January 1 - May 1	% by Weight
Rye (grain)	100

May 1 - August 15	% by Weight
German Millet	100

August 15 - December 15	% by Weight
Rye (grain)	100

2. Mulch:

   a. For seeded areas: Clean, seed-free, threshed straw of oats, wheat, barley, rye, beans, peanuts, or other locally available mulch material which does not contain an excessive quantity of matured seeds of noxious weeds or other species that will grow or be detrimental to seeding, or provide a menace to surrounding land. Do not use material which is fresh or excessively brittle, or which is decomposed and will smother or retard growth of grass.
   b. Trees and shrubs: Hardwood chips, shredded bark, or other material as approved by the Engineer.

3. Fertilizer: Commercial fertilizer meeting applicable requirements of State and Federal law. Cyanic compound or hydrated lime not permitted in mixed fertilizers.

   a. For lawn-type seeding and sod: 5-10-5 analysis.
   b. For temporary seeding: 5-10-5 analysis.

4. Water: Water free from substances harmful to grass or sod growth. Provide water from source approved prior to use.

5. Plants:

   a. See plants on Drawings.
   b. Sound, healthy, vigorous, with normal top and root systems, free from disease, insect pests or their eggs, grown in same or colder climatic zone as project.

      1) Nursery grown stock, freshly dug. No heeled-in, cold storage or collected stock.
      2) Species and size as indicated on Drawings.

   c. Deciduous shade trees: Single leader, straight trunk, well-branched, free of branches up to 6 FT high, and with symmetrical growth.
   d. Balled and burlapped plants (B&B): Firm, natural balls of soil.
   e. Container grown plants (CG): Roots well established in soil, grown in container for at least one growing season.
   f. Bare root plants (BR): Intact root system, cleaned of earth, wrapped immediately in wet straw, moss or other suitable material.

B. ACCESSORIES

1. Tree Stakes: Furnish as detailed or in full accordance with State Specifications.

2. Staking Wire: 12 GA galvanized.

32 92 00.03: EXECUTION

A. SOIL PREPARATION

1. General:

   a. Limit preparation to areas which will be planted soon after.
   b. Provide facilities to protect and safeguard all persons on or about premises.
   c. Protect existing trees designated to remain.
   d. Verify location and existence of all underground utilities. Take necessary precaution to protect existing utilities from damage due to construction activity. Repair all damages to utility items at sole expense.
   e. Provide facilities such as protective fences and/or watchmen to protect work from vandalism. Contractor is responsible for vandalism until acceptance of work in whole or in part.

2. Preparation for Lawn-Type Seeding, Sprigging, Plugging or Sodding:

   a. Loosen surface to minimum depth of 4 IN. Remove stones over 1 IN in any dimension and sticks, roots, rubbish, and other extraneous matter.
   b. Prior to applying fertilizer, loosen areas to be seeded with a double disc or other suitable device if the soil has become hard or compacted. Correct any surface irregularities in order to prevent pocket or low areas which will allow water to stand.
   c. Distribute fertilizer uniformly over areas to be seeded at a rate of 30 LBS per 1000 SF.

d. Incorporate fertilizer into soil to a depth of at least 2 IN by discing, harrowing, or other approved methods. Remove stones or other substances from surface which will interfere with turf development or subsequent mowing operations.
e. Grade lawn areas to a smooth, even surface with a loose, uniformly fine texture. Roll and rake, remove ridges and fill depressions, as required to meet finish grades. Limit fine grading to areas which can be planted soon after preparation.
f. Restore lawn areas to specified condition if eroded or otherwise disturbed after fine grading and before planting.

3. Preparation for Temporary Seeding:

a. Loosen surface to a minimum depth of 4-6 IN. Remove stones over 1 IN in any dimension and sticks, roots, rubbish and other extraneous matter.
b. Prior to applying fertilizer loosen areas to be seeded with a double disc or other suitable device if the soil has become hardened or compacted. Correct any surface irregularities in order to prevent pocket or low areas which will allow water to stand.
c. Distribute fertilizer at a rate of 700-1000 LB per acre. Fertilizer should be incorporated into the top 4-6 IN of soil.

B. INSTALLATION

1. Lawn-Type and Pasture Seeding:

a. Do not use seed which is wet, moldy, or otherwise damaged.
b. Perform seeding work from March 15 to April 15 for spring planting, and September 15 to October 15 for fall planting, unless otherwise approved by Engineer.
c. Employ satisfactory methods of sowing using mechanical power-driven drills or seeders, or mechanical hand seeders, or other approved equipment.
d. Distribute seed evenly over entire area as specified in 2.1.A.3, 50 percent sown in one direction, remainder at right angles to first sowing.
e. Stop work when work extends beyond most favorable planting season for species designated, or when satisfactory results cannot be obtained because of drought, high winds, excessive moisture, or other factors. Resume work only when favorable conditions develop.
f. Lightly rake seed into soil followed by light rolling or cultipacking.
g. Immediately protect seeded areas against erosion by mulching. Spread mulch in continuous blanket using 1-1/2 tons per acre to a depth of 4 or 5 straws.

2. Temporary Seeding:

a. Do not use seed which is wet, moldy, otherwise damaged.
b. Seed the appropriate species for the planting season as specified in 2.1 A.4.
c. Employ satisfactory methods of sowing using mechanical power driven drills or seeders, or mechanical hand seeders, or other approved equipment.

d. Evenly apply seed at the following rates:

Species	Rate (lb/acre)
Rye	120
German Millet	40

e. Small grains should be planted no more than 1 inch deep, and grasses no more than 1/2 inch deep.
f. Lightly rake seed into soil followed by light rolling or cultipacking.
g. Immediately protect seeded areas against erosion by mulching. Spread mulch in continuous blanket using 1-1/2 tons per acre to a depth of 4 or 5 straws.

C. PLANTING TREES, SHRUBS, AND GROUND COVERS

1. Preparation:

a. Handle plants so that roots or balls are adequately protected from breakage of balls, from sun or drying winds. Ensure tops or roots of plants are not permitted to dry out.
b. During transportation, protect materials from wind and sun to prevent tops and roots from drying out.
c. Protect tops of plants from damage. Plants with damaged tops will be rejected.
d. For purpose of inspection and planting identification, attach durable, legible labels to bundle or container of plant material delivered at the planting site. State the correct plant name and size of each plant in weather-resistant ink on labels.
e. Do not prune trees and shrubs at nursery.

2. Planting Season:

a. Plant deciduous shade trees and shrubs any time the ground is suitable between October 15 and June 1.
b. Plant evergreen material between September 1 and June 1.
c. Plant ground covers between March 15 and June 1.

3. Planting Procedure:

a. Indicate locations of plants for approval by Engineer before excavating plant locations.
b. In event underground construction, utilities, obstructions, or rock are encountered in excavation of plantings, secure alternate locations from Engineer. Make said changes without additional compensation. Where tree locations fall under existing overhead wires, or crowd existing trees, adjust locations as directed by Engineer.
c. Excavate pits and beds as necessary and in accordance with American Standard for Nursery Stock. Loosen bottom of pits prior to planting. Excavation is unclassified; excavate all materials without additional cost.

d. Tree and shrub pits to be circular in shape with vertical sides at least 1 FT greater in diameter than ball diameter. Pit to be of sufficient depth to provide 6 IN of planting soil under ball when set to natural grade.

e. Shrub and ground cover beds:

1) Plant shrubs used in mass plantings in individual holes of required size. Strip all sod from among mass planting.

2) For ground cover beds, remove sod from within limits of bed. Add soil amendments as specified and mix or roto-till with existing topsoil to a depth of 6 IN.

f. Set plants straight or plumb, in locations when indicated and at such level that after settlement they bear same relationship to finished grade as they did in their former setting. Carefully tamp planting soil under and around base of balls to prevent voids. Remove burlap, rope and wires from top of balls. Do not remove burlap from sides and bottom of balls.

g. Backfill plants with planting soil. Tamp to 1/2 depth of pit and thoroughly water and puddle before bringing backfill to proper grade. After planting has been completed, flood the pit again so that backfill is thoroughly saturated and settled.

h. After planting is complete, form a level saucer 3 IN high around each tree extending to limit of plant pit for watering purposes.

i. Mulch plant pit after saucer has been shaped. Mulch to limits of the pit and uniformly over ground and cover beds to a depth of 3 IN. In mass plantings of shrubs, mulch entire area uniformly among shrubs to a depth of 3 IN. If mulching is delayed and soil has dried out, water plants thoroughly before spreading mulch.

j. Staking: Stake trees immediately after planting as detailed on Drawings or in accordance with Nursery Standards.

k. Wrap deciduous trees 2 IN or more in caliper by neatly overlapping wrapping material between ground line and second branch. Place ties at top and bottom of wrapping material and not more than 12 IN apart between top and bottom ties.

l. Remove dead or damaged branches. Thin deciduous material to about two-thirds of initial branching. Remove only dead or damaged branches from evergreens.

m. Water plants during planting operations. Water each plant a minimum of once each week until final acceptance. Apply sufficient water to moisten backfill about each plant so that moisture will extend into the surrounding soil.

D. MAINTENANCE AND REPLACEMENT

1. General:

a. Begin maintenance of planted areas immediately after each portion is planted and continue to maintain until final acceptance.

b. Provide and maintain temporary piping, hoses, and watering equipment as required to convey water from water sources and to keep planted areas uniformly moist as required for proper growth.

c. Protection of new materials: Provide barricades, coverings or other types of protection necessary to prevent damage to existing improvements indicated to remain. Repair and pay for all damaged items.
d. Replace unacceptable materials with materials and methods identical to the original specifications unless otherwise approved by the Engineer.

2. Seeded:

a. Maintain seeded lawns until final acceptance.
b. Maintenance period begins at completion of planting or installation of entire area to be seeded or sodded.
c. Engineer will review seeded or sodded lawn area after installation for initial acceptance.
d. Maintain lawns by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, re-grading, and replanting as required to establish a smooth, uniform lawn, free of weeds and eroded or bare areas.
e. Lay out temporary lawn watering system and arrange watering schedule to avoid walking over muddy and newly seeded areas. Use equipment and water to prevent puddling and water erosion and displacement of seed or mulch.
f. Mow lawns as soon as there is enough top growth to cut with mower set at recommended height for principal species planted. Repeat mowing as required to maintain height. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Time initial and subsequent mowing as required to maintain a height of 1-1/2 to 2 IN. Do not mow lower than 1-1/2 IN.
g. Re-mulch with new mulch in areas where mulch has been disturbed by wind or maintenance operations sufficiently to nullify its purpose. Anchor as required to prevent displacement.
h. Unacceptable plantings are those areas that do not meet the quality of the specified material, produce the specified results, or were not installed to the specified methods.
i. Replant bare areas using same materials specified.
j. Engineer will review final acceptability of installed areas at end of maintenance period.

3. Temporary Seeding:

a. Maintenance period begins at completion of seeding.
b. Engineer will review seeded area after installation for initial acceptance.
c. Re-fertilize if growth is not fully adequate.
d. Reseed, re-fertilize and mulch immediately following erosion or other damage.
e. Protect from traffic as much as possible.

4. Trees and Shrubs:

a. Maintenance includes but is not limited to watering when necessary, removing dead or dying branches, removing sprouts and suckers; tightening, repairing or replacing tree stakes and wrapping; maintaining mulch to originally specified depth; and weeding plant beds and pits.

b. Remove and replace all new plants supplied, which are impaired, dead, or dying during one (1) year from initial acceptance.

c. Engineer will review completed planting for acceptability of installation. Approval of planting denotes initial acceptance and the beginning of the maintenance period.

E. FINAL ACCEPTANCE

1. Lawns will be acceptable provided all requirements, including maintenance, have been complied with, and a healthy, uniform close stand of specified grass is established, free of weeds, bare or dead spots, and surface irregularities.