WAGRAM EQUIPMENT SHOP
SCOTLAND COUNTY, NORTH CAROLINA
DIVISION 8

WBS#: 45511.5
SCO#: 14-11279-01A

June 30, 2017

MHAworks
PLANNING ARCHITECTURE INTERIORS

501 WASHINGTON STREET, SUITE G, DURHAM, NC 27701
P 919.682.2870 - F 919.682.5369

Project Manual

WAGRAM EQUIPMENT SHOP

SCOTLAND COUNTY, NORTH CAROLINA
DIVISION 8
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

WBS NO. 45511.5
SCO ID: 14-11279-01A

Architect:
MHAworks Architects
501 Washington Street
Durham, North Carolina 27701

Structural Engineer:
NC Department of Transportation
Facilities Division
Raleigh, North Carolina 27601

PME Engineer:
Brittain Engineering, Inc.
Box 939
Hickory, North Carolina 28603

Civil Engineer
Covington & Associates
811 Eula Street
Greensboro, North Carolina 27403

June 30, 2017

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PROJECT:	**WAGRAM EQUIPMENT SHOP** NC Department of Transportation 23161 Airbase Road Laurinburg, NC 28352 Scotland County, NC
OWNER:	NC Department of Transportation
ARCHITECT:	MHAworks, PA 501 Washington St. Suite G Durham, NC 27701 William N. Gardner, AIA
ENGINEERS:	
CIVIL:	Covington & Associates Greensboro, NC (336) 632-0011 James Covington, PE
STRUCTURAL:	Facilities Design, NCDOT Raleigh, NC (919) 707-4540 Michael Mountcastle, PE
PLUMBING MECHANICAL & ELECTRICAL:	Brittain Engineering, Inc. Hickory, NC (828) 328-1813 Donald Brittain, PE

ADVERTISEMENT FOR BIDS

Sealed proposals will be received until 2:00 PM on Thursday, July 27, 2017, in the NCDOT Highways Division 8 Office Conference Room at 902 N. Sandhills Blvd., Aberdeen, NC 28315 for the construction of:

NCDOT Highways Division 8 Wagram Equipment Shop
23161 Airbase Road, Laurinburg, NC 28352, Scotland County,

at which time and place bids will be opened and read.

A MANDATORY Pre-Bid Meeting and non-mandatory HUB Outreach will be held on Thursday, July 6, 2017 at 2:00 pm on site in the NCDOT Highways Division 8 Scotland Maintenance Office " bull room" (Wagram) at 23161 Airbase Road. Laurinburg, NC 28352. Site visits are recommended and are by appointment only. Only bidders who have attended the mandatory Pre-Bid meeting shall be eligible to submit bids for consideration.

Complete plans and specifications for this project may be obtained from:

William N. Gardner, AIA, NCARB
MHAWORKS ARCHITECTS
501 Washington Street,
Durham, North Carolina 27701

During normal office hours; Plan deposit $150.00 per printed set; or by free download at
http://www.ncdot.gov/doh/operations/division8/

The State reserves the unqualified right to reject any and all proposals.

Owner:
Sterling D. Baker. PE, Director
Facilities Management Division, NCDOT
1 South Wilmington Street
Raleigh, North Carolina 27601
(919) 707-4540

N O T I C E T O B I D D E R S

Sealed proposals will be received by the NCDOT in the NCDOT Highways Division 8 Office Conference Room at 902 N. Sandhills Blvd., Aberdeen, NC 28315, up to **2:00 pm on July 27, *2*017**, and immediately thereafter publicly opened and read aloud for the furnishing of labor, material and equipment entering into the construction of:

NCDOT Highways Division 8 Wagram Equipment Shop
23161 Airbase Road, Laurinburg, NC 28352, Scotland County, NC

This project consists of a one story 9,748 square foot Equipment Shop, (a pre-manufactured metal building) with concrete masonry walls, and related site work.

Bids will be received for a Single Prime Contract, combined bid for all work including General, Plumbing, Mechanical and Electrical. All proposals shall be lump sum.

Alternate #1 is for a detached 1000 square foot tire storage building as indicated on the drawings. Alternates #2, 3, & 4 address paving various areas of the parking lot as indicated on the civil drawings. Alternate #5 addresses LED lights in lieu of fluorescents.

Pre-Bid Meeting

An open **mandatory** pre-bid meeting will be held for all interested bidders on **July 6, 2017 at 2:00 pm** at the Scotland Maintenance Office "bull room", 23161 Airbase Road, Laurinburg, NC. The meeting will address project specific questions, issues, bidding procedures and bid forms.

Following the Pre-Bid Meeting, will be a meeting to discuss the requirements for Minority Participation on the project. The meeting will be held in the same location as the Pre-Bid Meeting. Please reference the requirements for Minority Participation included in the Bid Documents. Any questions related to Minority Participation are to be directed to Ms. Bonnie Simmons. Ms. Simmons' contact information: (T) 919-707-4549, (E) btsimmons@ncdot.gov.

Complete plans, specifications, and contract documents will be open for inspection in the offices of the Owner, NC Department of Transportation (Division. 8); in the local North Carolina offices of McGraw-Hill Dodge Corporation, and in the Eastern Regional Office of Reed Construction Data in Norcross, GA and in the following Minority Plan Rooms:

Hispanic Contractors Association of the Carolinas (HCAC) in Winston-Salem, Charlotte and Raleigh Areas-
877-227-1680

NCIMED Plan & Resource Center, 114 West Parrish Street, 6th Floor, Durham, NC 27701, 919-956-8889 or
919-287-3036

or may be obtained by those qualified as prime bidders, upon deposit of one hundred fifty dollars ($150.00) in cash or certified check. The full plan deposit will be returned to those bidders provided all documents are returned in good, usable condition within ten (10) days after the bid date.

Digital documents will also be available in the plan rooms of the Associated General Contractors, Carolinas Branch, Raleigh (919) 781-3270 (mgilchrist@carolinasagc.org); in the North Carolina office of McGraw-Hill Dodge Corporation (704) 599-9461 (dodge_document_ca@mcgraw-hill.com); in the Eastern Regional Office of Reed Construction

Data in Norcross, GA (800) 424-3996 (docprocessing@reedbusiness.com); and the Hispanic Contractors Association of the Carolinas in Raleigh (877) 227-1680 (HCAcarolinas@isqft.com).

Complete plans, specifications, and contract documents for this project will also be posted in .pdf format at the following web address: **http://www.ncdot.gov/doh/operations/division8/**

NOTE: The bidder shall include with the bid proposal the form *Identification of Minority Business Participation* identifying the minority business participation it will use on the project and shall include either *Affidavit **A*** or *Affidavit **B*** as applicable. Forms and instructions are included within the Proposal Form in the bid documents. Failure to complete these forms is grounds for rejection of the bid. (GS143-128.2c Effective 1/1/2002.)

All contractors are hereby notified that they must have proper license as required under the state laws governing their respective trades.

General contractors are notified that Chapter 87, Article 1, General Statutes of North Carolina, will be observed in receiving and awarding general contracts. General contractors submitting bids on this project must have license classification for Building Construction.

> NOTE--SINGLE PRIME CONTRACTS: Under GS 87-1, a contractor that superintends or manages construction of any building, highway, public utility, grading, structure or improvement shall be deemed a "general contractor" and shall be so licensed. Therefore, a single prime project that involves other trades will require the single prime contractor to hold a proper General Contractors license. **EXCEPT**: On public buildings being bid single prime, where the total value of the general construction does not exceed 25% of the total construction value, contractors under GS87- Arts 2 and 4 (Plumbing, Mechanical & Electrical) may bid and contract directly with the Owner as the SINGLE PRIME CONTRACTOR and may subcontract to other properly licensed trades. GS87-1.1-Rules .0210

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

A performance bond and a payment bond will be required for one hundred percent (100%) of the contract price.

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

No bid may be withdrawn after the scheduled closing time for the receipt of bids for a period of 30 days.

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

Designer:
William N. Gardner, AIA, NCARB
MHAworks Architects
501 Washington Street
Durham, North Carolina 27701
(919) 682-2870

Owner:
Sterling D. Baker, PE, Director
Facilities Management Division, NCDOT
1 South Wilmington Street
Raleigh, North Carolina 27601
(919) 707-4540

INSTRUCTIONS TO BIDDERS

AND

GENERAL CONDITIONS OF THE CONTRACT

STANDARD FORM FOR CONSTRUCTION PROJECTS

STATE CONSTRUCTION OFFICE

NORTH CAROLINA

DEPARTMENT OF ADMINISTRATION

Form OC-15

This document is intended for use on State capital construction projects and shall not be used on any project that is not reviewed and approved by the State Construction Office. Extensive modification to the General Conditions by means of "Supplementary General Conditions" is strongly discouraged. State agencies and institutions may include special requirements in "Division 1 – General Requirements" of the specifications, where they do not conflict with the General Conditions.

Twenty Fourth Edition January 2013

INSTRUCTIONS TO BIDDERS

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

1. **PROPOSALS**

Proposals must be made in strict accordance with the Form of Proposal provided therefor, and all blank spaces for bids, alternates, and unit prices applicable to bidder's work shall be properly filled in. When requested alternates are not bid, the proposer shall so indicate by the words "No Bid". Any blanks shall also be interpreted as "No Bid".The bidder agrees that bid on Form of Proposal detached from specifications will be considered and will have the same force and effect as if attached thereto. Photocopied or faxed proposals will not be considered. Numbers shall be stated both in writing and in figures for the base bids and alternates. If figures and writing differ, the written number will supersede the figures.

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

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

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

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

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

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

e. All signatures shall be properly witnessed.

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

Proposals should be addressed as indicated in the Advertisement for Bids and be delivered, enclosed in an opaque sealed envelope, marked "Proposal" and bearing the title of the work, name of the bidder, and the contractor's license number of the bidder. Bidders should clearly mark on the outside of the bid envelope which contract(s) they are bidding.

Bidder shall identify on the bid**,** the minority businesses that will be utilized on the project with corresponding total dollar value of the bid and affidavit listing good faith efforts or an affidavit indicating work under contract will be self-performed, as required by G.S. 143-128.2(c) and G.S. 143-128.2(f). Failure to comply with these requirements is grounds for rejection of the bid.

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

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

Unit prices quoted in the proposal shall include overhead and profit and shall be the full compensation for the contractor's cost involved in the work. See General Conditions, Article 19c-1.

2. EXAMINATION OF CONDITIONS

It is understood and mutually agreed that by submitting a bid the bidder acknowledges that he has carefully examined all documents pertaining to the work, the location, accessibility and general character of the site of the work and all existing buildings and structures within and adjacent to the site, and has satisfied himself as to the nature of the work, the condition of existing buildings and structures, the conformation of the ground, the character, quality and quantity of the material to be encountered, the character of the equipment, machinery, plant and any other facilities needed preliminary to and during prosecution of the work, the general and local conditions, the construction hazards, and all other matters, including, but not limited to, the labor situation which can in any way affect the work under the contract, and including all safety measures required by the Occupational Safety and Health Act of 1970 and all rules and regulations issued pursuant thereto. It is further mutually agreed that by submitting a proposal the bidder acknowledges that he has satisfied himself as to the feasibility and meaning of the plans, drawings, specifications and other contract documents for the construction of the work and that he accepts all the terms, conditions and stipulations contained therein; and that he is prepared to work in cooperation with other contractors performing work on the site.

Reference is made to contract documents for the identification of those surveys and investigation reports of subsurface or latent physical conditions at the site or otherwise affecting performance of the work which have been relied upon by the designer in preparing the documents. The owner will make copies of all such surveys and reports available to the bidder upon request.

Each bidder may, at his own expense, make such additional surveys and investigations as he may deem necessary to determine his bid price for the performance of the work. Any on-site investigation shall be done at the convenience of the owner. Any reasonable request for access to the site will be honored by the owner.

3. BULLETINS AND ADDENDA

Any addenda to specifications issued during the time of bidding are to be considered covered in the proposal and in closing a contract they will become a part thereof. It shall be the bidder’s responsibility to ascertain prior to bid time the addenda issued and to see that his bid includes any changes thereby required.

Should the bidder find discrepancies in, or omission from, the drawings or documents or should he be in doubt as to their meaning, he shall at once notify the designer who will send written instructions in the form of addenda to all bidders. Notification should be no later than seven (7) days prior to the date set for receipt of bids. Neither the owner nor the designer will be responsible for any oral instructions.

All addenda should be acknowledged by the bidder(s) on the Form of Proposal. However, even if not acknowledged, by submitting a bid, the bidder has certified that he has reviewed all issued addenda and has included all costs associated within his bid.

4. **BID SECURITY**

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

Bid bond shall be conditioned that the surety will, upon demand, forthwith make payment to the obligee upon said bond if the bidder fails to execute the contract. The owner may retain bid securities of any bidder(s) who may have a reasonable chance of award of contract for the full duration of time stated in the Notice to Bidders. Other bid securities may be released sooner, at the discretion of the owner. All bid securities (cash or certified checks) shall be returned to the bidders promptly after award of contracts, and no later then seven (7) days after expiration of the holding period stated in the Notice to Bidders. Standard Form of Bid Bond is included in these specifications and shall be used.

5. **RECEIPT OF BIDS**

Bids shall be received in strict accordance with requirements of the General Statutes of North Carolina. Bid security shall be required as prescribed by statute. Prior to the closing of the bid, the bidder will be permitted to change or withdraw his bid. Guidelines for opening of public construction bids are available from the State Construction Office.

6. **OPENING OF BIDS**

Upon opening, all bids shall be read aloud. Once bidding is closed, there shall not be any withdrawal of bids by any bidder and no bids may be returned by the designer to any bidder. After the opening of bids, no bid may be withdrawn, except under the provisions of General Statute 143-129.1, for a period of thirty days unless otherwise specified. Should the successful bidder default and fail to execute a contract, the contract may be awarded to the next lowest and responsible bidder. The owner reserves the unqualified right to reject any and all bids. Reasons for rejection may include, but shall not be limited to, the following:

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

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

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

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

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

f. If the unit prices contained in the bid schedule are unacceptable to the owner and the State Construction Office.

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

7. **BID EVALUATION**

The award of the contract will be made to the lowest responsible bidder as soon as practical. The owner may award on the basis of the base bid and any alternates the owner chooses.

Before awarding a contract, the owner may require the apparent low bidder to qualify himself to be a responsible bidder by furnishing any or all of the following data:

a. The latest financial statement showing assets and liabilities of the company or other information satisfactory to the owner.

b. A listing of completed projects of similar size.

c. Permanent name and address of place of business.

d. The number of regular employees of the organization and length of time the organization has been in business under present name.

e. The name and home office address of the surety proposed and the name and address of the responsible local claim agent.

f. The names of members of the firms who hold appropriate trade licenses, together with license numbers.

g. If prequalified, contractor info will be reviewed and evaluated comparatively to submitted prequalification package.

Failure or refusal to furnish any of the above information, if requested, shall constitute a basis for disqualification of any bidder.

In determining the lowest responsible, responsive bidder, the owner shall take into consideration the bidder's compliance with the requirements of G.S. 143-128.2(c), the past performance of the bidder on construction contracts for the State with particular concern given to completion times, quality of work, cooperation with other contractors, and cooperation with the designer and owner. Failure of the low bidder to furnish affidavit and/or documentation as required by G.S. 143-128.2(c) shall constitute a basis for disqualification of the bid.

Should the owner adjudge that the apparent low bidder is not the lowest responsible, responsive bidder by virtue of the above information, said apparent low bidder will be so notified and his bid security shall be returned to him.

8. **PERFORMANCE BOND**

The successful bidder, upon award of contract, shall furnish a performance bond in an amount equal to 100 percent of the contract price. See Article 35, General Conditions.

9. **PAYMENT BOND**

The successful bidder, upon award of contract, shall furnish a payment bond in an amount equal to 100 percent of the contract price. See Article 35, General Conditions.

10. **PAYMENTS**

Payments to the successful bidders (contractors) will be made on the basis of monthly estimates. See Article 31, General Conditions.

11. **PRE-BID CONFERENCE**

Prior to the date set for receiving bids, the Designer may arrange and conduct a Pre-Bid Conference for all prospective bidders. The purpose of this conference is to review project requirements and to respond to questions from prospective bidders and their subcontractors or material suppliers related to the intent of bid documents. Attendance by prospective bidders shall be as required by the "Notice to Bidders".

12. **SUBSTITUTIONS**

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

Submittals for proposed substitutions shall include the following information:

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

b. Trade name, model or catalog designation.

c. Product data including performance and test data, reference standards, and technical descriptions of material, product, or equipment. Include color samples and samples of available finishes as appropriate.

d. Detailed comparison with specified products including performance capabilities, warranties, and test results.

e. Other pertinent data including data requested by the Designer to confirm product equality.

If a proposed material, product, or equipment substitution is deemed equal by the Designer to those specified, all bidders of record will be notified by Addendum**.**

GENERAL CONDITIONS OF THE CONTRACT

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ARTICLE 1 - DEFINITIONS

a. The **contract documents** consist of the Notice to Bidders; Instructions to Bidders; General Conditions of the Contract; special conditions if applicable; Supplementary General Conditions; the drawing and specifications, including all bulletins, addenda or other modifications of the drawings and specifications incorporated into the documents prior to their execution; the proposal; the contract; the performance bond; the payment bond; insurance certificates; the approval of the attorney general; and the certificate of the Office of State Budget and Management. All of these items together form the contract.

b. The **owner** is the State of North Carolina through the agency named in the contract.

c. The **designer(s)** are those referred to within this contract, or their authorized representatives. The Designer(s), as referred to herein, shall mean architect and/or engineer. They will be referred to hereinafter as if each were of the singular number, masculine gender.

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

e. A **subcontractor**, as the term is used herein, shall be understood to be one who has entered into a direct contract with a contractor, and includes one who furnishes materials worked to a special design in accordance with plans and specifications covered by the contract, but does not include one who only sells or furnishes materials not requiring work so described or detailed.

f. **Written notice** shall be defined as notice in writing delivered in person to the contractor, or to a partner of the firm in the case of a partnership, or to a member of the contracting organization, or to an officer of the organization in the case of a corporation, or sent to the last known business address of the contracting organization by registered mail.

g. **Work**, as used herein as a noun, is intended to include materials, labor, and workmanship of the appropriate contractor.

h. The **project** is the total construction work to be performed under the contract documents by the several contractors.

i. **Project Expediter,** as used herein, is an entity stated in the contract documents, designated to effectively facilitate scheduling and coordination of work activities. See Article 14(f) for responsibilities of a Project Expediter. **For the purposes of a single prime contract, the single prime contractor shall be designated as the Project Expediter.**

j. **Change order**, as used herein, shall mean a written order to the contractor subsequent to the signing of the contract authorizing a change in the contract. The change order shall be signed by the contractor, designer and the owner, and approved by the State Construction Office, in that order (Article 19).

k. **Field Order,** as used herein, shall mean a written approval for the contractor to proceed with the work requested by owner prior to issuance of a formal Change Order. The field order shall be signed by the contractor, designer, owner, and State Construction Office.

l. **Time of completion**, as stated in the contract documents, is to be interpreted as consecutive calendar days measured from the date established in the written Notice to Proceed, or such other date as may be established herein (Article 23).

m. **Liquidated damages,** as stated in the contract documents [, is an amount reasonably estimated in advance to cover the consequential damages associated with the Owner's economic loss in not being able to use the Project for its intended purposes at the end of the contract's completion date as amended by change order, if any, by reason of failure of the contractor(s) to complete the work within the time specified. Liquidated damages does not include the Owner's extended contract administration costs (including but not limited to additional fees for architectural and engineering services, testing services, inspection services, commissioning services, etc.), such other damages directly resulting from delays caused solely by the contractor, or consequential damages that the Owner identified in the bid documents that may be impacted by any delay caused soley by the Contractor (e.g., if a multi-phased project-subsequent phases, delays in start other projects that are dependent on the completion of this Project, extension of leases and/or maintenance agreements for other facilities).

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

o. **Routine written communications between the Designer and the Contractor** are any communication other than a "request for information" provided in letter, memo, or transmittal format, sent by mail, courier, electronic mail, or facsimile. Such communications can not be identified as "request for information".

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

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

r. **Inspection** shall mean examination or observation of work completed or in progress to determine its compliance with contract documents.

s. **"Equal to" or "approved equal"** shall mean materials, products, equipment, assemblies, or installation methods considered equal by the bidder in all characteristics (physical, functional, and aesthetic) to those specified in the contract documents. Acceptance of equal is subject to approval of Designer and owner.

t. **"Substitution" or "substitute"** shall mean materials, products, equipment, assemblies, or installation methods deviating in at least one characteristic (physical, functional, or aesthetic) from those specified, but which in the opinion of the bidder would improve competition and/or enhance the finished installation. Acceptance of substitution is subject to the approval of the Designer and owner.

u. **Provide** shall mean furnish and install complete in place, new, clean, operational, and ready for use.

v. **Indicated and shown** shall mean provide as detailed, or called for, and reasonably implied in the contract documents.

w. **Special inspector** is one who inspects materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with the approved construction documents and referenced standards.

x. **Commissioning** is a quality assurance process that verifies and documents that building components and systems operate in accordance to the owner's project requirements and the project design documents.

y. **Designer Final Inspection** is the inspection performed by the design team to determine the completeness of the project in accordance with approved plans and specifications. This inspection occurs prior to SCO final inspection.

z. **SCO Final Inspection** is the inspection performed by the State Construction Office to determine the completeness of the project in accordance with NC Building Codes and approved plans and specifications.

aa. **Beneficial Occupancy** is requested by the owner and is occupancy or partial occupancy of the building after all life safety items have been completed as determined by the State Construction Office. Life safety items include but not limited to fire alarm, sprinkler, egress and exit lighting, fire rated walls, egress paths and security.

bb. Final Acceptance is the date in which the State Construction Office accepts the construction as totally complete. This includes the SCO Final Inspection and certification by the designer that all punch lists are completed.

ARTICLE 2 - INTENT AND EXECUTION OF DOCUMENTS

a. The drawings and specifications are complementary, one to the other, and that which is shown on the drawings or called for in the specifications shall be as binding as if it were both called for and shown. The intent of the drawings and specifications is to establish the scope of all labor, materials, transportation, equipment, and any and all other things necessary to provide a bid for a complete job. In case of discrepancy or disagreement in the contract documents, the order of precedence shall be: Form of Contract, specifications, large-scale detail drawings, small-scale drawings.

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

c. The contractor shall execute each copy of the proposal, contract, performance bond and payment bond as follows:

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

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

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

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

5. All signatures shall be properly witnessed.

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

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

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

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

10. The contractor's signature on the performance bond and the payment bond shall correspond with that on the contract. The date of performance and payment bond shall not be prior to the date of the contract.

ARTICLE 3 - CLARIFICATIONS AND DETAIL DRAWINGS

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

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

ARTICLE 4 - COPIES OF DRAWINGS AND SPECIFICATIONS

The designer or Owner shall furnish free of charge to the contractors electronic copies of plans and specifications. If requested by the contractor, paper copies of plans and specifications shall be furnished free of charge as follows:

a. General contractor - Up to twelve (12) sets of general contractor drawings and specifications, up to six (6) sets of which shall include drawings and specifications of all other contracts, plus a clean set of black line prints on white paper of all appropriate

drawings, upon which the contractor shall clearly and legibly record all work-in-place that is at variance with the contract documents.

b. Each other contractor - Up to six (6) sets of the appropriate drawings and specifications, up to three (3) sets of which shall include drawings and specifications of all other contracts, plus a clean set of black line prints on white paper of all appropriate drawings, upon which the contractor shall clearly and legibly record all work-in-place that is at variance with the contract documents.

c. Additional sets shall be furnished at cost, including mailing, to the contractor upon request by the contractor. This cost shall be stated in the bidding documents.

d. For the purposes of a single-prime contract, the contractor shall receive up to 30 sets of drawings and specifications, plus a clean set of black line prints on white paper of all appropriate drawings, upon which the contractor shall clearly and legibly record all work-in-place that is at variance with the contract documents.

ARTICLE 5 - SHOP DRAWINGS, SUBMITTALS, SAMPLES, DATA

a. Within 15 consecutive calendar days after the notice to proceed, each prime contractor shall submit a schedule for submission of all shop drawings, product data, samples, and similar submittals through the Project Expediter to the Designer. This schedule shall indicate the items, relevant specification sections, other related submittal, data, and the date when these items will be furnished to the designer.

b. The Contractor(s) shall review, approve and submit to the Designer all Shop Drawings, Coordination Drawings, Product Data, Samples, Color Charts, and similar submittal data required or reasonably implied by the Contract Documents. Required Submittals shall bear the Contractor's stamp of approval, any exceptions to the Contract Documents shall be noted on the submittals, and copies of all submittals shall be of sufficient quantity for the Designer to retain up to three (3) copies of each submittal for his own use plus additional copies as may be required by the Contractor. Submittals shall be presented to the Designer in accordance with the schedule submitted in paragraph (a). so as to cause no delay in the activities of the Owner or of separate Contractors.

c. The Designer shall review required submittals promptly, noting desired corrections if any, and retaining three (3) copies (1 for the Designer, 1 for the owner and 1 for SCO) for his use. The remaining copies of each submittal shall be returned to the Contractor not later than twenty (20) days from the date of receipt by the Designer, for the Contractor's use or for corrections and resubmittal as noted by the Designer. When resubmittals are required, the submittal procedure shall be the same as for the original submittal***s.***

d. Approval of shop drawings/submittals by the Designer shall not be construed as relieving the Contractor from responsibility for compliance with the design or terms of the contract documents nor from responsibility of errors of any sort in the shop drawings, unless such lack of compliance or errors first have been called in writing to the attention of the Designer by the Contractor.

ARTICLE 6 - WORKING DRAWINGS AND SPECIFICATIONS AT THE JOB SITE

a. The contractor shall maintain, in readable condition at his job office, one complete set of working drawings and specifications for his work including all shop drawings. Such

drawings and specifications shall be available for use by the designer, his authorized representative, owner or State Construction Office.

b. The contractor shall maintain at the job office, a day-to-day record of work-in-place that is at variance with the contract documents. Such variations shall be fully noted on project drawings by the contractor and submitted to the designer upon project completion and no later than 30 days after final acceptance of the project.

c. The contractor shall maintain at the job office a record of all required tests that have been performed, clearly indicating the scope of work inspected and the date of approval or rejection.

ARTICLE 7 - OWNERSHIP OF DRAWINGS AND SPECIFICATIONS

All drawings and specifications are instruments of service and remain the property of the owner. The use of these instruments on work other than this contract without permission of the owner is prohibited. All copies of drawings and specifications other than contract copies shall be returned to the owner upon request after completion of the work.

ARTICLE 8 - MATERIALS, EQUIPMENT, EMPLOYEES

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

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

c. Upon notice, the contractor shall furnish evidence as to quality of materials.

d. Products are generally specified by ASTM or other reference standard and/or by manufacturer's name and model number or trade name. When specified only by reference standard, the Contractor may select any product meeting this standard, by any manufacturer. When several products or manufacturers are specified as being equally acceptable, the Contractor has the option of using any product and manufacturer combination listed. However, the contractor shall be aware that the cited examples are used only to denote the quality standard of product desired and that they do not restrict bidders to a specific brand, make, manufacturer or specific name; that they are used only to set forth and convey to bidders the general style, type, character and quality of product desired; and that equivalent products will be acceptable. Request for substitution of materials, items, or equipment shall be submitted to the designer for approval or disapproval; such approval or disapproval shall be made by the designer prior to the opening of bids. Alternate materials may be requested after the award if it can clearly be demonstrated that it is an added benefit to the owner and the designer and owner approves.

e. The designer is the judge of equality for proposed substitution of products, materials or equipment.

g. If at any time during the construction and completion of the work covered by these contract documents, the language, conduct, or attire of any workman of the various crafts be adjudged a nuisance to the owner or designer, or if any workman be considered detrimental to the work, the contractor shall order such parties removed immediately from grounds.

ARTICLE 9 - ROYALTIES, LICENSES AND PATENTS

It is the intention of the contract documents that the work covered herein will not constitute in any way infringement of any patent whatsoever unless the fact of such patent is clearly evidenced herein. The contractor shall protect and save harmless the owner against suit on account of alleged or actual infringement. The contractor shall pay all royalties and/or license fees required on account of patented articles or processes, whether the patent rights are evidenced hereinafter.

ARTICLE 10 - PERMITS, INSPECTIONS, FEES, REGULATIONS

a. The contractor shall give all notices and comply with all laws, ordinances, codes, rules and regulations bearing on the conduct of the work under this contract. If the contractor observes that the drawings and specifications are at variance therewith, he shall promptly notify the designer in writing. See Instructions to Bidders, Paragraph 3, Bulletins and Addenda. Any necessary changes required after contract award shall be made by change order in accordance with Article 19. If the contractor performs any work knowing it to be contrary to such laws, ordinances, codes, rules and regulations, and without such notice to the designer, he shall bear all cost arising therefrom. Additional requirements implemented after bidding will be subject to equitable negotiations.

b. All work under this contract shall conform to the North Carolina State Building Code and other State, local and national codes as are applicable. The cost of all required inspections and permits shall be the responsibility of the contractor and included within the bid proposal. All water taps, meter barrels, vaults and impact fees shall be paid by the contractor unless otherwise noted.

d. Projects constructed by the State of North Carolina or by any agency or institution of the State are not subject to inspection by any county or municipal authorities and are not subject to county or municipal building codes. The contractor shall, however, cooperate with the county or municipal authorities by obtaining building permits. Permits shall be obtained at no cost.

e. Projects involving local funding (community colleges) are subject also to county and municipal building codes and inspection by local authorities. The contractor shall pay the cost of these permits and inspections.

ARTICLE 11 - PROTECTION OF WORK, PROPERTY AND THE PUBLIC

a. The contractors shall be jointly responsible for the entire site and the building or construction of the same and provide all the necessary protections, as required by the owner or designer, and by laws or ordinances governing such conditions. They shall be responsible for any damage to the owner's property, or of that of others on the job, by them, their personnel, or their subcontractors, and shall make good such damages. They shall be responsible for and pay for any damages caused to the owner. All contractors shall have access to the project at all times.

b. The contractor shall provide cover and protect all portions of the structure when the work is not in progress, provide and set all temporary roofs, covers for doorways, sash and windows, and all other materials necessary to protect all the work on the building, whether set by him, or any of the subcontractors. Any work damaged through the lack of proper protection or from any other cause, shall be repaired or replaced without extra cost to the owner.

c. No fires of any kind will be allowed inside or around the operations during the course of construction without special permission from the designer and owner.

d. The contractor shall protect all trees and shrubs designated to remain in the vicinity of the operations by building substantial boxes around same. He shall barricade all walks, roads, etc., as directed by the designer to keep the public away from the construction. All trenches, excavations or other hazards in the vicinity of the work shall be well barricaded and properly lighted at night.

e. The contractor shall provide all necessary safety measures for the protection of all persons on the job, including the requirements of the A.G.C. *Accident Prevention Manual in Construction,* as amended, and shall fully comply with all state laws or regulations and North Carolina State Building Code requirements to prevent accident or injury to persons on or about the location of the work. He shall clearly mark or post signs warning of hazards existing, and shall barricade excavations, elevator shafts, stairwells and similar hazards. He shall protect against damage or injury resulting from falling materials and he shall maintain all protective devices and signs throughout the progress of the work.

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

g. The contractor shall designate a responsible person of his organization as safety officer/inspector to inspect the project site for unsafe health and safety hazards, to report these hazards to the contractor for correction, and whose duties also include accident prevention on the project, and to provide other safety and health measures on the project site as required by the terms and conditions of the contract.The name of the safety inspector shall be made known to the designer and owner at the time of the preconstruction conference and in all cases prior to any work starting on the project.

h. In the event of emergency affecting the safety of life, the protection of work, or the safety of adjoining properties, the contractor is hereby authorized to act at his own discretion, without further authorization from anyone, to prevent such threatened injury or damage.

Any compensation claimed by the contractor on account of such action shall be determined as provided for under Article 19(b).

i. Any and all costs associated with correcting damage caused to adjacent properties of the construction site or staging area shall be borne by the contractor. These costs shall include but not be limited to flooding, mud, sand, stone, debris, and discharging of waste products.

ARTICLE 12 - SEDIMENTATION POLLUTION CONTROL ACT OF 1973

a. Any land-disturbing activity performed by the contractor(s) in connection with the project shall comply with all erosion control measures set forth in the contract documents and any additional measures which may be required in order to ensure that the project is in full compliance with the Sedimentation Pollution Control Act of 1973, as implemented by Title 15, North Carolina Administrative Code, Chapter 4, Sedimentation Control, Subchapters 4A, 4B and 4C, as amended (15 N.C.A.C. 4A, 4B and 4C).

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

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

d. To the fullest extent permitted by law, the contractor(s) shall indemnify and hold harmless the owner, the designer and the agents, consultants and employees of the owner and designer, from and against all claims, damages, civil penalties, losses and expenses, including, but not limited to, attorneys' fees, arising out of or resulting from the performance of work or failure of performance of work, provided that any such claim, damage, civil penalty, loss or expense is attributable to a violation of the Sedimentation Pollution Control Act. Such obligation shall not be construed to negate, abridge or otherwise reduced any other right or obligation of indemnity which would otherwise exist as to any party or persons described in this article.

ARTICLE 13 - INSPECTION OF THE WORK

a. It is a condition of this contract that the work shall be subject to inspection during normal working hours and during any time work is in preparation and progress by the designer, designated official representatives of the owner, State Construction Office and those persons required by state law to test special work for official approval. The contractor shall therefore provide safe access to the work at all times for such inspections.

b. All instructions to the contractor will be made only by or through the designer or his designated project representative. Observations made by official representatives of the owner shall be conveyed to the designer for review and coordination prior to issuance to the contractor.

c. All work shall be inspected by designer, special inspector and/or State Construction Office prior to being covered by the contractor. Contractor shall give a minimum two weeks notice unless otherwise agreed to by all parties. If inspection fails, after the first reinspection all costs associated with additional reinspections shall be borne by the contractor.

d. Where special inspection or testing is required by virtue of any state laws, instructions of the designer, specifications or codes, the contractor shall give adequate notice to the designer of the time set for such inspection or test, if the inspection or test will be conducted by a party other than the designer. Such special tests or inspections will be made in the presence of the designer, or his authorized representative, and it shall be the contractor's responsibility to serve ample notice of such tests.

e. All laboratory tests shall be paid by the owner unless provided otherwise in the contract documents except the general contractor shall pay for laboratory tests to establish design mix for concrete, and for additional tests to prove compliance with contract documents where materials have tested deficient except when the testing laboratory did not follow the appropriate ASTM testing procedures.

f. Should any work be covered up or concealed prior to inspection and approval by the designer, special inspector, and/or State Construction Office such work shall be uncovered or exposed for inspection, if so requested by the designer in writing. Inspection of the work will be made upon notice from the contractor. All cost involved in uncovering, repairing, replacing, recovering and restoring to design condition, the work that has been covered or concealed will be paid by the contractor involved.

ARTICLE 14 - CONSTRUCTION SUPERVISION AND SCHEDULE

a. Throughout the progress of the work, each contractor shall keep at the job site**,** a competent superintendent and supervisory staff satisfactory to the designer and the owner. The superintendent and supervisory staff shall not be changed without the consent of the designer and owner unless said superintendent ceases to be employed by the contractor or ceases to be competent as determined by the contractor, designer or owner. The superintendent and other staff designated by the contractor in writing shall have authority to act on behalf of the contractor, and instructions, directions or notices given to him shall be as binding as if given to the contractor. However, directions, instructions, and notices shall be confirmed in writing.

b. The contractor shall examine and study the drawings and specifications and fully understand the project design, and shall provide constant and efficient supervision to the work. Should he discover any discrepancies of any sort in the drawings or specifications, he shall report them to the designer without delay. He will not be held responsible for discrepancies in the drawings and/or specifications, but shall be held responsible to report them should they become known to him.

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

d. The contractor is required to attend job site progress conferences as called by the designer. The contractor shall be represented at these job progress conferences by both home office and project personnel. These representatives shall have authority to act on

behalf of the contractor. These meetings shall be open to subcontractors, material suppliers and any others who can contribute toward maintaining required job progress. It shall be the principal purpose of these meetings, or conferences, to effect coordination, cooperation and assistance in every practical way toward the end of maintaining progress of the project on schedule and to complete the project within the specified contract time. Each contractor shall be prepared to assess progress of the work as required in his particular contract and to recommend remedial measures for correction of progress as may be appropriate. The designer or his authorized representative shall be the coordinator of the conferences and shall preside as chairman. The contractor shall turn over a copy of his daily reports to the Designer and Owner at the job site progress conference. Owner will determine daily report format.

e The contractor(s) shall, employ an engineer or a land surveyor licensed in the State of North Carolina to lay out the work and to establish a bench mark in a location where same will not be disturbed and where direct instruments sights may be taken.

f. The designer shall designate a Project Expediter on projects involving two or more prime contracts. The Project Expediter shall be designated in the Supplementary General Conditions. The Project Expediter shall have at a minimum the following responsibilities**.**

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

2. Maintain a project progress schedule for all contractors.

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

4. Notify the designer of any changes in the project schedule.

5. Recommend to the owner whether payment to a contractor shall be approved**.**

g. It shall be the responsibility of the Project Expediter to cooperate with and obtain from several prime contractors and subcontractors on the job, their respective work activities and integrate these activities into a project construction schedule in form of a detailed bar chart or Critical Path Method (CPM), schedule. Each prime contractor shall provide work activities within fourteen (14) days of request by the Project Expediter. A "work activity", for scheduling purposes, shall be any component or contractual requirement of the project requiring at least one (1) day, but not more than fourteen (14) days, to complete or fulfill**.** The project construction schedule shall graphically show all salient features of the work required to construct the project from start to finish and within the allotted time established in the contract. The time (in days) between the contractor's early completion and contractual completion dates is part of the project total float time; and shall be used as such, unless amended by a change order**.** On a multi-prime project, each prime contractor shall review the proposed construction schedule and approve same in writing**.** The Project Expediter shall submit the proposed construction schedule to the designer for comments. The complete Project construction schedule shall be of the type

set forth in the Supplementary General Condition or subparagraph (1) or (2) below, as appropriate:

1. For a project with total contracts of $500,000 or less, a bar chart schedule will satisfy the above requirement. The schedule shall indicate the estimated starting and completion dates for each major element of the work.

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

Bar Chart Schedule: Where a bar chart schedule is required, it shall be time-scaled in weekly increments, shall indicate the estimated starting and completion dates for each major element of the work by trade and by area, level, or zone, and shall schedule dates for all salient features, including but not limited to the placing of orders for materials, submission of shop drawings and other Submittals for approval, approval of shop drawings by designers, the manufacture and delivery of material, the testing and the installation of materials, supplies and equipment, and all Work activities to be performed by the Contractor. The Contractor shall allow sufficient time in his schedule for all commissioning, required inspections and completion of final punchlist(s). Each Work activity will be assigned a time estimate by the Contractor. One day shall be the smallest time unit used.

CPM Schedule: Where a CPM schedule is required, it shall be in time-scaled precedence format using the Project Expediter's logic and time estimates. The CPM schedule shall be drawn or plotted with activities grouped or zoned by Work area or subcontract as opposed to a random (or scattered) format. The CPM schedule shall be time-scaled on a weekly basis and shall be drawn or plotted at a level of detail and logic which will schedule all salient features of the work to be performed by the Contractor. The Contractor shall allow sufficient time in his schedule for all commissioning, required inspections and completion of final punchlist(s).. Each Work activity will be assigned a time estimate by the Contractor. One day shall be the smallest time unit used.

The CPM schedule will identify and describe each activity, state the duration of each activity, the calendar dates for the early and late start and the early and late finish of each activity, and clearly highlight all activities on the critical path. "Total float" and "free float" shall be indicated for all activities. Float time shall not be considered for the exclusive use or benefit of either the Owner or the Contractor, but must be allocated in the best interest of completing the Work within the Contract time. Extensions to the Contract time, when granted by Change Order, will be granted only when equitable time adjustment exceeds the Total Float in the activity or path of activities affected by the change. On contracts with a price over $2,500,000, the CPM schedule shall also show what part of the Contract Price is attributable to each activity on the schedule, the sum of which for all activities shall equal the total Contract Price.

Early Completion of Project: The Contractor may attempt to complete the project prior to the Contract Completion Date. However, such planned early completion shall

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

h. The proposed project construction schedule shall be presented to the designer no later than fifteen (15) days after written notice to proceed. No application for payment will be processed until this schedule is accepted by the designer and owner.

i. The approved project construction schedule shall be distributed to all contractors and displayed at the job site by the Project Expediter.

j. The several contractors shall be responsible for their work activities and shall notify the Project Expediter of any necessary changes or adjustments to their work. The Project Expediter shall maintain the project construction schedule, making biweekly adjustments, updates, corrections, etc., that are necessary to finish the project within the Contract time, keeping all contractors and the designer fully informed. Copy of a bar chart schedule annotated to show the current progress shall be submitted by the Contractor(s) to the designer, along with monthly request for payment. For project requiring CPM schedule, the Contractor shall submit a biweekly report of the status of all activities. The_bar chart schedule or status report shall show the actual Work completed to date in comparison with the original Work scheduled for all activities. If any activities of the work of several contractors are behind schedule, the contractor must indicate in writing, what measures will be taken to bring each such activity back on schedule and to ensure that the Contract Completion Date is not exceeded. A plan of action and recovery schedule shall be developed and submitted to the designer by the Project Expediter, when (1) the contractor’s report indicates delays, that are in the opinion of the designer or the owner, of sufficient magnitude that the contractor’s ability to complete the work by the scheduled completion is brought into question; (2) the updated construction schedule is thirty (30) days behind the planned or baseline schedule and no legitimate time extensions, as determined by the Designer, are in process; and (3) the contractor desires to make changes in the logic (sequencing of work) or the planned duration of future activities of the CPM schedule which, in the opinion of the designer or the owner, are of a major nature. The plan of action, when required shall be submitted to the Owner for review within two (2) business days of the Contractor receiving the Owner's written demand. The recovery schedule, when required, shall be submitted to the Owner within five (5) calendar days of the Contractor's receiving the Owner's written demand. Failure to provide an updated construction schedule or a recovery schedule may be grounds for rejection of payment_applications or withholding of funds as set forth in Article 33.

k. The Project Expediter shall notify each contractor of such events or time frames that are critical to the progress of the job. Such notice shall be timely and reasonable. Should the progress be delayed due to the work of any of the several contractors, it shall be the duty of the Project Expediter to immediately notify the contractor(s) responsible for such delay, the designer, the State Construction Office and other prime contractors. The designer shall determine the contractor(s) who caused the delays and notify the bonding

company of the responsible contractor(s) of the delays; and shall make a recommendation to the owner regarding further action.

l. Designation as Project Expediter entails an additional project control responsibility and does not alter in any way the responsibility of the contractor so designated, nor the responsibility of the other contractors involved in the project. The project expeditor's Superintendent(s) shall be in attendance at the Project site at all times when work is in progress unless conditions are beyond the control of the Contractor or until termination of the Contract in accordance with the Contract Documents. It is understood that such Superintendent shall be acceptable to the Owner and Designer and shall be the one who will be continued in that capacity for the duration of the project unless he ceases to be on the Contractor's payroll or the Owner otherwise agrees. The Superintendent shall not be employed on any other project for or by the Contractor or by any other entity during the course of the Work. If the Superintendent is employed by the Contractor on another project without the Owner's approval, then the Owner may deduct from the Contractor's monthly general condition costs and amount representing the Superintendent's cost and shall deduct that amount for each month thereafter until the Contractor has the Superintendent back on the Owner's Project full-time.

ARTICLE 15 - SEPARATE CONTRACTS AND CONTRACTOR RELATIONSHIPS

a. Effective from January 1, 2002, Chapter 143, Article 8, was amended, to allow public contracts to be delivered by the following delivery methods: single-prime, dual (single-prime and separate-prime), construction manager at risk, and alternative contracting method as approved by the State Building Commission. The owner reserves the right to prepare separate specifications, receive separate bids, and award separate contracts for such other major items of work as may be in the best interest of the State. For the purposes of a single prime contract, refer to Article 1 – Definitions.

b. All contractors shall cooperate with each other in the execution of their work, and shall plan their work in such manner as to avoid conflicting schedules or delay of the work. See Article 14, Construction Supervision.

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

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

e. The designer and the owner shall have access to the work whenever it is in preparation and progress and during normal working hours. The contractor shall provide facilities for such access so the designer may perform his functions under the contract documents.

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

ARTICLE 16 - SUBCONTRACTS AND SUBCONTRACTORS

a. Within thirty (30) days after award of the contract, the contractor shall submit to the designer, owner and to the State Construction Office a list giving the names and addresses of subcontractors and equipment and material suppliers he proposes to use, together with the scope of their respective parts of the work. Should any subcontractor be disapproved by the designer or owner, the designer or owner shall submit his reasons for disapproval in writing to the State Construction Office for its consideration with a copy to the contractor. If the State Construction Office concurs with the designer's or owner's recommendation, the contractor shall submit a substitute for approval. The designer and owner shall act promptly in the approval of subcontractors, and when approval of the list is given, no changes of subcontractors will be permitted except for cause or reason considered justifiable by the designer or owner.

b. The designer will furnish to any subcontractor, upon request, evidence regarding amounts of money paid to the contractor on account of the subcontractor's work.

c. The contractor is and remains fully responsible for his own acts or omissions as well as those of any subcontractor or of any employee of either. The contractor agrees that no contractual relationship exists between the subcontractor and the owner in regard to the contract, and that the subcontractor acts on this work as an agent or employee of the contractor.

d. The owner reserves the right to limit the amount of portions of work to be subcontracted as hereinafter specified.

ARTICLE 17 - CONTRACTOR AND SUBCONTRACTOR RELATIONSHIPS

The contractor agrees that the terms of these contract documents shall apply equally to each subcontractor as to the contractor, and the contractor agrees to take such action as may be necessary to bind each subcontractor to these terms. The contractor further agrees to conform to the Code of Ethical Conduct as adopted by the Associated General Contractors of America, Inc., with respect to contractor-subcontractor relationships, and that payments to subcontractors shall be made in accordance with the provisions of G.S. 143-134.1 titled Interest on final payments due to prime contractors: payments to subcontractors.

a. On all public construction contracts which are let by a board or governing body of the state government or any political subdivision thereof, except contracts let by the Department of Transportation pursuant to G.S. 136-28.1, the balance due prime contractors shall be paid in full within 45 days after respective prime contracts of the project have been accepted by the owner, certified by the architect, engineer or designer to be completed in accordance with terms of the plans and specifications, or occupied by the owner and used for the purpose for which the project was constructed, whichever occurs first. Provided, however, that whenever the architect or consulting engineer in charge of the project determines that delay in completion of the project in accordance with terms of the plans and specifications is the fault of the contractor, the project may be occupied and used for the purposes for which it was constructed without payment of any interest on amounts withheld past the 45 day limit. No payment shall be delayed

because of the failure of another prime contractor on such project to complete his contract. Should final payment to any prime contractor beyond the date such contracts have been certified to be completed by the designer or architect, accepted by the owner, or occupied by the owner and used for the purposes for which the project was constructed, be delayed by more than 45 days, said prime contractor shall be paid interest, beginning on the 46th day, at the rate of one percent (1%) per month or fraction thereof unless a lower rate is agreed upon on such unpaid balance as may be due. In addition to the above final payment provisions, periodic payments due a prime contractor during construction shall be paid in accordance with the payment provisions of the contract documents or said prime contractor shall be paid interest on any such unpaid amount at the rate stipulated above for delayed final payments. Such interest shall begin on the date the payment is due and continue until the date on which payment is made. Such due date may be established by the terms of the contract. Funds for payment of such interest on state-owned projects shall be obtained from the current budget of the owning department, institution or agency. Where a conditional acceptance of a contract exists, and where the owner is retaining a reasonable sum pending correction of such conditions, interest on such reasonable sum shall not apply.

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

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

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

ARTICLE 18 - DESIGNER'S STATUS

a. The designer shall provide general administration of the performance of construction contracts, including liaison and necessary inspection of the work to ensure compliance with plans and specifications. He is the agent of the owner only for the purpose of constructing this work and to the extent stipulated in the contract documents. He has authority to direct work to be performed, to stop work, to order work removed, or to order corrections of faulty work, where any such action by the designer may be necessary to assure successful completion of the work.

b. The designer is the impartial interpreter of the contract documents, and, as such, he shall exercise his powers under the contract to enforce faithful performance by both the owner and the contractor, taking sides with neither.

c. Should the designer cease to be employed on the work for any reason whatsoever, then the owner shall employ a competent replacement who shall assume the status of the former designer.

d. The designer and his consultants will make inspections of the project. He will inspect the progress, the quality and the quantity of the work.

e. The designer and the owner shall have access to the work whenever it is in preparation and progress during normal working hours. The contractor shall provide facilities for such access so the designer and owner may perform their functions under the contract documents.

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

ARTICLE 19 - CHANGES IN THE WORK

a. The owner may have changes made in the work covered by the contract. These changes will not invalidate and will not relieve or release the contractor from any guarantee given by him pertinent to the contract provisions. These changes will not affect the validity of the guarantee bond and will not relieve the surety or sureties of said bond. All extra work shall be executed under conditions of the original contract.

b. Except in an emergency endangering life or property, no change shall be made by the contractor except upon receipt of approved change order or written field order from the designer, countersigned by the owner and the state construction office authorizing such change. No claim for adjustments of the contract price shall be valid unless this procedure is followed.

A field order, transmitted by fax, electronically, or hand delivered, may be used where the change involved impacts the critical path of the work. A formal change order shall be issued as expeditiously as possible.

In the event of emergency endangering life or property, the contractor may be directed to proceed on a time and material basis whereupon the contractor shall proceed and keep accurately on such form as specified by the designer or owner, a correct account of costs together with all proper invoices, payrolls and supporting data. Upon completion of the work the change order will be prepared as outlined under either Method "c(1)" or Method "c(2)" or both.

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

1. Where the extra work involved is covered by unit prices quoted in the proposal, or subsequently agreed to by the Contractor, Designer, Owner and State Construction Office the value of the change shall be computed by application of unit prices based on quantities, estimated or actual as agreed of the items involved, except is such cases where a quantity exceeds the estimated quantity allowance in the contract by one hundred percent (100%) or more. In such cases, either party may elect to

proceed under subparagraph c2 herein. If neither party elects to proceed under c2, then unit prices shall apply.

2. The contracting parties shall negotiate and agree upon the equitable value of the change prior to issuance of the change order, and the change order shall stipulate the corresponding lump sum adjustment to the contract price.

d. Under Paragraph “b” and Methods "c(2)" above, the allowances for overhead and profit combined shall be as follows: all contractors (the single contracting entity (prime), his subcontractors(1st tier subs), or their sub-subcontractors (2nd tier subs, 3rd tier subs, etc)) shall be allowed a maximum of 10% on work they each self-perform; the prime contractor shall be allowed a maximum of 5% on contracted work of his 1st tier sub; 1st tier, 2nd tier, 3rd tier, etc contractors shall be allowed a maximum of 2.5% on the contracted workof their subs. ; Under Method "c(1)", no additional allowances shall be made for overhead and profit. In the case of deductible change orders, under Method "c(2)" and Paragraph (b) above, the contractor shall include no less than five percent (5%***)*** profit, but no allowances for overhead.

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

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

2. The actual costs of labor expended on the project site; labor expended in coordination, change order negotiation, record document maintenance, shop drawing revision or other tasks necessary to the administration of the project are considered overhead whether they take place in an office or on the project site.

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

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

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

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

f. Should concealed conditions be encountered in the performance of the work below grade, or should concealed or unknown conditions in an existing structure be at variance with the conditions indicated by the contract documents, the contract sum and time for completion may be equitably adjusted by change order upon claim by either party made within thirty (30) days after the condition has been identified. The cost of such change shall be arrived at by one of the foregoing methods. All change orders shall be supported by a unit cost breakdown showing method of arriving at net cost as defined above.

g. In all change orders, the procedure will be for the designer to request proposals for the change order work in writing. The contractor will provide such proposal and supporting data in suitable format. The designer shall verify correctness. Delay in the processing of the change order due to lack of proper submittal by the contractor of all required supporting data shall not constitute grounds for a time extension or basis of a claim. Within fourteen (14) days after receipt of the contractor's accepted proposal including all supporting documentation required by the designer**,** the designer shall prepare the change order and forward to the contractor for his signature or otherwise respond, in writing, to the contractor's proposal. Within seven (7) days after receipt of the change order executed by the contractor, the designer shall, certify the change order by his signature, and forward the change order and all supporting data to the owner for the owner's signature. The owner shall execute the change order and forward to the State Construction Office for final approval**,** within seven (7) days of receipt. The State Construction Office shall act on the change order within seven (7) days. In case of emergency or extenuating circumstances, approval of changes may be obtained verbally by telephone or field orders approved by all parties, then shall be substantiated in writing as outlined under normal procedure.

h. At the time of signing a change order, the contractor shall be required to certify as follows:

"I certify that my bonding company will be notified forthwith that my contract has been changed by the amount of this change order, and that a copy of the approved change order will be mailed upon receipt by me to my surety."

i. A change order, when issued, shall be full compensation, or credit, for the work included, omitted or substituted. It shall show on its face the adjustment in time for completion of the project as a result of the change in the work.

j. If, during the progress of the work, the owner requests a change order and the contractor's terms are unacceptable, the owner**,** with the approval of the State Construction Office, may require the contractor to perform such work on a time and material basis whereupon the contractor shall proceed and keep accurately on such form as specified by the Designer or owner, a correct account of cost together with all proper invoices, payrolls and supporting data. Upon completion of the work a change order will be prepared with allowances for overhead and profit per paragraph d. above and "net cost" and "cost" per paragraph e. above. Without prejudice, nothing in this paragraph shall preclude the owner from performing or to have performed that portion of the work requested in the change order.

ARTICLE 20 - CLAIMS FOR EXTRA COST

a. Should the contractor consider that as a result of instructions given by the designer, he is entitled to extra cost above that stated in the contract, he shall give written notice thereof to the designer within seven (7) days without delay. The written notice shall clearly state that a claim for extra cost is being made and shall provide a detailed justification for the extra cost. The contractor shall not proceed with the work affected until further advised, except in emergency involving the safety of life or property, which condition is covered in Article 19(b) and Article 11(h). No claims for extra compensation shall be considered unless the claim is so made. The designer shall render a written decision within seven (7) days of receipt of claim.

b. The contractor shall not act on instructions received by him from persons other than the designer, and any claims for extra compensation or extension of time on account of such

instruction will not be honored. The designer shall not be responsible for misunderstandings claimed by the contractor of verbal instructions which have not been confirmed in writing, and in no case shall instructions be interpreted as permitting a departure from the contract documents unless such instruction is confirmed in writing and supported by a properly authorized change order.

c. Should a claim for extra compensation that complies with the requirements of (a) above by the contractor and is denied by the designer or owner, and cannot be resolved by a representative of the State Construction Office, the contractor may request a mediation in connection with GS 143-128(f1) in the dispute resolution rules adopted by the State Building Commission (1 N.C.A.C. 30H .0101 through .1001). If the contractor is unable to resolve its claim as a result of mediation, the contractor may pursue the claim in accordance with the provisions of G.S. 143-135.3, or G.S. 143-135.6 where Community Colleges are the owner,and the following:

1. A contractor who has not completed a contract with a board for construction or repair work and who has not received the amount he claims is due under the contract may submit a verified written claim to the director of the State Construction Office of the Department of Administration for the amount the contractor claims is due. The director may deny, allow or compromise the claim, in whole or in part. A claim under this subsection is not a contested case under Chapter 150B of the General Statutes.

2. (a) A contractor who has completed a contract with a board for construction or repair work and who has not received the amount he claims is due under the contract may submit a verified written claim to the director of the State Construction Office of the Department of Administration for the amount the contractor claims is due. The claim shall be submitted within sixty (60) days after the contractor receives a final statement of the board's disposition of his claim and shall state the factual basis for the claim.

(b) The director shall investigate a submitted claim within ninety (90) days of receiving the claim, or within any longer time period upon which the director and the contractor agree. The contractor may appear before the director, either in person or through counsel, to present facts and arguments in support of his claim. The director may allow, deny or compromise the claim, in whole or in part. The director shall give the contractor a written statement of the director's decision on the contractor's claim.

(c) A contractor who is dissatisfied with the director's decision on a claim submitted under this subsection may commence a contested case on the claim under Chapter 150B of the General Statutes. The contested case shall be commenced within sixty (60) days of receiving the director's written statement of the decision.

(d) As to any portion of a claim that is denied by the director, the contractor may, in lieu of the procedures set forth in the preceding subsection of this section, within six (6) months of receipt of the director's final decision, institute a civil action for the sum he claims to be entitled to under the contract by filing a verified complaint and the issuance of a summons in the Superior Court of Wake County or in the superior court of any county where the work under the contract was performed. The procedure shall be the same as in all civil actions except that all issues shall be tried by the judge, without a jury.

ARTICLE 21 - MINOR CHANGES IN THE WORK

The designer will have the authority to order minor changes in the work not involving an adjustment in the contract sum or time for completion, and not inconsistent with the intent of the contract documents. Such changes shall be effected by written order, copied to the State Construction Office, and shall be binding on the owner and the contractor.

ARTICLE 22 - UNCORRECTED FAULTY WORK

Should the correction of faulty or damaged work be considered inadvisable or inexpedient by the owner and the designer, the owner shall be reimbursed by the contractor. A change order will be issued to reflect a reduction in the contract sum.

ARTICLE 23 - TIME OF COMPLETION, DELAYS, EXTENSION OF TIME

a. The time of completion is stated in the Supplementary General Conditions and in the Form of Construction Contract. The Project Expediter, upon notice of award of contract, shall prepare a construction schedule to complete the project within the time of completion as required by Article 14.

b. The contractors shall commence work to be performed under this agreement on a date to be specified in a written Notice to Proceed from the designer and shall fully complete all work hereunder within the time of completion stated. Time is of the essence and the contractor acknowledges the Owner will likely suffer financial damage for failure to complete the work within the time of completion. For each day in excess of the above number of days, the contractor(s) shall pay the owner the sum stated as liquidated damages reasonably estimated in advance to cover the losses to be incurred by the owner by reason of failure of said contractor(s) to complete the work within the time specified, such time being in the essence of this contract and a material consideration thereof.

c. In the event of multiple prime contractors, the designer shall be the judge as to the division of responsibility between the contractor(s), based on the construction schedule, weekly reports and job records, and shall apportion the amount of liquidated damages to be paid by each of them, according to delay caused by any or all of them.

d. If the contractor is delayed at any time in the progress of his work solely by any act or negligence of the owner, the designer, or by any employee of either; by any separate contractor employed by the owner; by changes ordered in the work; by labor disputes at the project site; by abnormal weather conditions not reasonably anticipated for the locality where the work is performed; by unavoidable casualties; by any causes beyond the contractor's control; or by any other causes which the designer and owner determine may justify the delay, then the contract time may be extended by change order only for the time which the designer and owner may determine is reasonable.

   Time extensions will not be granted for rain, wind, snow or other natural phenomena of normal intensity for the locality where work is performed. For purpose of determining extent of delay attributable to unusual weather phenomena, a determination shall be made by comparing the weather for the contract period involved with the average of the preceding five (5) year climatic range during the same time interval based on the National Oceanic and Atmospheric Administration National Weather Service statistics for the locality where work is performed and on daily weather logs kept on the job site by the contractor reflecting the effect of the weather on progress of the work and initialed by the designer's representative. No weather delays shall be considered after the building is dried in unless work claimed to be delayed is on the critical path of the baseline schedule or approved updated schedule. Time extensions for weather delays, acts of God, labor

disputes, fire, delays in transportation, unavoidable casualties or other delays which are beyond the control of the Owner do not entitle the Contractor to compensable damages for delays. Any contractor claim for compensable damages for delays is limited to delays caused solely by the owner or its agents. Contractor caused delays shall be accounted for before owner or designer caused delays in the case of concurrent delays.

e. Request for extension of time shall be made in writing to the designer, copies to the owner and SCO, within twenty (20) days following cause of delay. In case of continuing cause for delay, the Contractor shall notify the Designer to the designer, copies to the owner and SCO, of the delay within 20 days of the beginning of the delay and only one claim is necessary.

f. The contractor shall notify his surety in writing of extension of time granted.

g. No claim for time extension shall be allowed on account of failure of the designer to furnish drawings or instructions until twenty (20) days after demand for such drawings and/or instructions. See Article 5c. Demand must be in written form clearly stating the potential for delay unless the drawings or instructions are provided. Any delay granted will begin after the twenty (20) day demand period is concluded.

ARTICLE 24 - PARTIAL UTILIZATION/BENEFICIAL OCCUPANCY

a. The owner may desire to occupy or utilize all or a portion of the project prior to the completion of the project.

b. Should the owner request a utilization of a building or portion thereof, the designer shall perform a designer final inspection of area after being notified by the contractor that the area is ready for such. After the contractor has completed designer final inspection punch list and the designer has verified, then the designer shall schedule a beneficial occupancy inspection at a time and date acceptable to the owner, contractor(s) and State Construction Office. If beneficial occupancy is granted by the State Construction Office, in such areas the following will be established:

    1. The beginning of guarantees and warranties period for the equipment necessary to support. in the area.

    2. The owner assumes all responsibiliites for utility costs for entire building.

    2. Contractor will obtain consent of surety.

    3. Contractor will obtain endorsement from insurance company permitting beneficial occupancy.

c. The owner shall have the right to exclude the contractor from any part of the project which the designer has so certified to be substantially complete, but the owner will allow the contractor reasonable access to complete or correct work to bring it into compliance with the contract.

d. Occupancy by the owner under this article will in no way relieve the contractor from his contractual requirement to complete the project within the specified time. The contractor will not be relieved of liquidated damages because of beneficial occupancy. The designer may prorate liquidated damages based on the percentage of project occupied.

ARTICLE 25 - FINAL INSPECTION, ACCEPTANCE, AND PROJECT CLOSEOUT

a. Upon notification from the contractor(s) that the project is complete and ready for inspection, the designer shall make a Designer final inspection to verify that the project is complete and ready for SCO final inspection. Prior to SCO final inspection, the contractor(s) shall complete all items requiring corrective measures noted at the Designer final inspection**.** The designer shall schedule a SCO final inspection at a time and date acceptable to the owner, contractor(s) and State Construction Office.

b. At the SCO final inspection, the designer and his consultants shall, if job conditions warrant, record a list of items that are found to be incomplete or not in accordance with the contract documents. At the conclusion of the SCO final inspection, the designer and State Construction Office representative shall make one of the following determinations:

1. That the project is completed and accepted.

2. That the project will be accepted subject to the correction of the list of discrepancies (punch list). All punch list items must be completed within thirty (30) days of SCO final inspection or the owner may invoke Article 28, Owner's Right to Do Work.

4. That the project is not complete and another date for a SCO final inspection will be established.

c. Within fourteen (14) days of final acceptance per Paragraph b1 or within fourteen (14) days after completion of punch list per Paragraph b2 above, the designer shall certify the work and issue applicable certificate(s) of compliance.

d. Any discrepancies listed or discovered after the date of SCO final inspection and acceptance under Paragraphs b1 or b2 above shall be handled in accordance with Article 42, Guarantee.

f. The final acceptance date will establish the following:

1. The beginning of guarantees and warranties period.

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

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

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

g. Prior to issuance of final acceptance date, the contractor shall have his authorized representatives visit the project and give full instructions to the designated personnel regarding operating, maintenance, care, and adjustment of all equipment and special construction elements. In addition, the contractor shall provide to the owner a complete instructional video (media format acceptable to the owner) on the operation, maintenance, care and adjustment of all equipment and special construction elements.

ARTICLE 26 - CORRECTION OF WORK BEFORE FINAL PAYMENT

a. Any work, materials, fabricated items or other parts of the work which have been condemned or declared not in accordance with the contract by the designer shall be

promptly removed from the work site by the contractor, and shall be immediately replaced by new work in accordance with the contract at no additional cost to the owner. Work or property of other contractors or the owner, damaged or destroyed by virtue of such faulty work, shall be made good at the expense of the contractor whose work is faulty.

b. Correction of condemned work described above shall commence within twenty-four (24) hours after receipt of notice from the designer, and shall make satisfactory progress, as determined by the designer, until completed.

c. Should the contractor fail to proceed with the required corrections, then the owner may complete the work in accordance with the provisions of Article 28.

ARTICLE 27 - CORRECTION OF WORK AFTER FINAL PAYMENT

See Article 35, Performance Bond and Payment Bond, and Article 42, Guarantee**.** Neither the final certificate, final payment, occupancy of the premises by the owner, nor any provision of the contract, nor any other act or instrument of the owner, nor the designer, shall relieve the contractor from responsibility for negligence, or faulty material or workmanship, or failure to comply with the drawings and specifications. Contractor shall correct or make good any defects due thereto and repair any damage resulting there from, which may appear during the guarantee period following final acceptance of the work except as stated otherwise under Article 42, Guarantee. The owner will report any defects as they may appear to the contractor and establish a time limit for completion of corrections by the contractor. The owner will be the judge as to the responsibility for correction of defects.

ARTICLE 28 - OWNER'S RIGHT TO DO WORK

If, during the progress of the work or during the period of guarantee, the contractor fails to prosecute the work properly or to perform any provision of the contract, the owner, after seven (7) days' written notice sent by certified mail, return receipt requested, to the contractor from the designer, may perform or have performed that portion of the work. The cost of the work may be deducted from any amounts due or to become due to the contractor, such action and cost of same having been first approved by the designer. Should the cost of such action of the owner exceed the amount due or to become due the contractor, then the contractor or his surety, or both, shall be liable for and shall pay to the owner the amount of said excess.

ARTICLE 29 - ANNULMENT OF CONTRACT

If the contractor fails to begin the work under the contract within the time specified, or the progress of the work is not maintained on schedule, or the work is not completed within the time above specified, or fails to perform the work with sufficient workmen and equipment or with sufficient materials to ensure the prompt completion of said work, or shall perform the work unsuitably or shall discontinue the prosecution of the work, or if the contractor shall become insolvent or be declared bankrupt or commit any act of bankruptcy or insolvency, or allow any final judgment to stand against him unsatisfied for a period of forty-eight (48) hours, or shall make an assignment for the benefit of creditors, or for any other cause whatsoever shall not carry on the work in an acceptable manner, the owner may give notice in writing, sent by certified mail, return receipt requested, to the contractor and his surety of such delay, neglect or default, specifying the same, and if the contractor within a period of seven (7) days after such notice shall not proceed in accordance therewith, then the owner shall, declare this contract in default, and, thereupon, the surety shall promptly take over the work and complete the performance of this contract in the manner and within the time frame specified. In the event the surety shall fail to take over the work to be done under this contract within seven (7) days after being so notified and notify the owner in writing, sent by

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

ARTICLE 30 - CONTRACTOR'S RIGHT TO STOP WORK OR TERMINATE THE CONTRACT

a. Should the work be stopped by order of a court having jurisdiction, or by order of any other public authority for a period of three months, due to cause beyond the fault or control of the contractor, or if the owner should fail or refuse to make payment on account of a certificate issued by the designer within forty-five (45) days after receipt of same, then the contractor, after fifteen (15) days' written notice sent by certified mail, return receipt requested, to the owner and the designer, may suspend operations on the work or terminate the contract.

b. The owner shall be liable to the contractor for the cost of all materials delivered and work performed on this contract plus 10 percent overhead and profit and shall make such payment. The designer shall be the judge as to the correctness of such payment.

ARTICLE 31 - REQUEST FOR PAYMENT

a. Not later than the fifth day of the month, the contractor shall submit to the designer a request for payment for work done during the previous month. The request shall be in the form agreed upon between the contractor and the designer, but shall show substantially the value of work done and materials delivered to the site during the period since the last payment, and shall sum up the financial status of the contract with the following information:

    1. Total of contract including change orders.

    2. Value of work completed to date.

    3. Less five percent (5%) retainage, provided however, that after fifty percent (50%) of the contractor’s work has been satisfactorily completed on schedule, with approval of the owner and the State Construction Office and written consent of the surety, further requirements for retainage will be waived only so long as work continues to be completed satisfactorily and on schedule.

    4. Less previous payments.

    5. Current amount due.

b. The contractor, upon request of the designer, shall substantiate the request with invoices of vouchers or payrolls or other evidence.

c. Prior to submitting the first request, the contractor shall prepare for the designer a schedule showing a breakdown of the contract price into values of the various parts of the work, so arranged as to facilitate payments to subcontractors in accordance with Article 17, Contractor and Subcontractor Relationships. The contractor(s) shall list the value of each subcontractor and supplier, identifying each minority business subcontractor and supplier as listed in Affidavit C, if applicable.

d. When payment is made on account of stored materials and equipment, such materials must be stored on the owner's property, and the requests for payments shall be accompanied by invoices or bills of sale or other evidence to establish the owner's title to such materials and equipment. Such payments will be made only for materials that have been customized or fabricated specifically for this project. Raw materials or commodity products including but not limited to piping, conduit, CMU, metal studs and gypsum board may not be submitted. Responsibility for such stored materials and equipment shall remain with the contractor regardless of ownership title. Such stored materials and equipment shall not be removed from the owner's property. Should the space for storage on-site be limited, the contractor, at his option, shall be permitted to store such materials and/or equipment in a suitable space off-site. Should the contractor desire to include any such materials or equipment in his application for payment, they must be stored in the name of the owner in an independent, licensed, bonded warehouse approved by the designer, owner and the State Construction Office and located as close to the site as possible. The warehouse selected must be approved by the contractor's bonding and insurance companies; the material to be paid for shall be assigned to the owner and shall be inspected by the designer. Upon approval by the designer, owner and SCO of the storage facilities and materials and equipment, payment therefore will be certified. Responsibility for such stored materials and equipment shall remain with the contractor. Such stored materials and equipment shall not be moved except for transportation to the project site. Under certain conditions, the designer may approve storage of materials at the point of manufacture, which conditions shall be approved by the designer, the owner and the State Construction Office prior to approval for the storage and shall include an agreement by the storing party which unconditionally gives the State absolute right to possession of the materials at anytime. Bond, security and insurance protection shall continue to be the responsibility of the contractor(s).

e. In the event of beneficial occupancy, retainage of funds due the contractor(s) may be reduced with the approval of the State Construction Office to an equitable amount to cover the list of items to be completed or corrected. Retainage may not be reduced to less than two and one-half (2 1/2) times the estimated value of the work to be completed or corrected. Reduction of retainage must be with the consent and approval of the contractor's bonding company.

ARTICLE 32 - CERTIFICATES OF PAYMENT AND FINAL PAYMENT

a. Within five (5) days from receipt of request for payment from the contractor, the designer shall issue and forward to the owner a certificate for payment. This certificate shall indicate the amount requested or as approved by the designer. If the certificate is not approved by the designer, he shall state in writing to the contractor and the owner his reasons for withholding payment.

b. No certificate issued or payment made shall constitute an acceptance of the work or any part thereof. The making and acceptance of final payment shall constitute a waiver of all claims by the owner except:

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

2. Faulty work or materials appearing after final payment.

3. Failure of the contractor to perform the work in accordance with drawings and specifications, such failure appearing after payment.

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

c. The making and acceptance of final payment shall constitute a waiver of all claims by the contractor except those claims previously made and remaining unsettled (Article 20(c)).

d. Prior to submitting request for final payment to the designer for approval, the contractor shall fully comply with all requirements specified in the" project closeout" section of the specifications. These requirements include but not limited to the following:

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

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

3. Record of Owner's training.

4. Resolution of any final inspection discrepancies.

5. Granting access to Contractor's records, if Owner's internal auditors have made a request for such access pursuant to Article 52.

e. The contractor shall forward to the designer, the final application for payment along with the following documents:

1. List of minority business subcontractors and material suppliers showing breakdown of contract amounts and total actual payments to subs and material suppliers.

2. Affidavit of Release of Liens.

3. Affidavit of contractors of payment to material suppliers and subcontractors. (See Article 36).

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

5. Certificates of state agencies required by state law.

f. The designer will not authorize final payment until the work under contract has been certified by designer, certificates of compliance issued, and the contractor has complied with the closeout requirements. The designer shall forward the contractor's final application for payment to the owner along with respective certificate(s) of compliance required by law.

ARTICLE 33 - PAYMENTS WITHHELD

a. The designer with the approval of the State Construction Office may withhold payment for the following reasons:

1. Faulty work not corrected.

2. The unpaid balance on the contract is insufficient to complete the work in the judgment of the designer.

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

b. The secretary of the Department of Administration may authorize the withholding of payment for the following reasons:

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

2. Evidence that subcontractors have not been paid.

c. The Owner may withhold all or a portion of Contractor's general conditions costs set forth in the approved schedule of values, if Contractor has failed to comply with: (1) a request to access its records by Owner's internal auditors pursuant to Article 52; (2) a request for a plan of action and/or recovery schedule under Article 14.j or provide The Owner; (3) a request to provide an electronic copies of Contractor's baseline schedule, updates with all logic used to create the schedules in the original format of the scheduling software; and (4) Contractor's failure to have its Superintendent on the Project full-time; (

d. When grounds for withholding payments have been removed, payment will be released. Delay of payment due the contractor without cause will make owner liable for payment of interest to the contractor in accordance with G.S. 143-134.1. As provided in G.S.143-134.1(e) the owner shall not be liable for interest on payments withheld by the owner for unsatisfactory job progess, defective construction not remedied, disputed work, or third-party claims filed against the owner or reasonable evidence that a third-party claim will be filed.

ARTICLE 34 - MINIMUM INSURANCE REQUIREMENTS

The work under this contract shall not commence until the contractor has obtained all required insurance and verifying certificates of insurance have been approved in writing by the owner. These certificates shall document that coverages afforded under the policies will not be cancelled, reduced in amount or coverages eliminated until at least thirty (30) days after mailing written notice, by certified mail, return receipt requested, to the insured and the owner of such alteration or cancellation. If endorsements are needed to comply with the notification or other requirements of this article copies of the endorsements shall be submitted with the certificates.

a. **Worker's Compensation and Employer's Liability**

The contractor shall provide and maintain, until final acceptance, workmen's compensation insurance, as required by law, as well as employer's liability coverage with minimum limits of $100,000.

b. **Public Liability and Property Damage**

The contractor shall provide and maintain, until final acceptance, comprehensive general liability insurance, including coverage for premises operations, independent contractors, completed operations, products and contractual exposures, as shall protect such contractors from claims arising out of any bodily injury, including accidental death, as well as from claims for property damages which may arise from operations under this contract, whether such operations be by the contractor or by any subcontractor, or by anyone directly or indirectly employed by either of them and the minimum limits of such insurance shall be as follows:

Bodily Injury:	$500,000 per occurrence
Property Damage:	$100,000 per occurrence / $300,000 aggregate

In lieu of limits listed above, a $500,000 combined single limit shall satisfy both conditions.

Such coverage for completed operations must be maintained for at least two (2) years following final acceptance of the work performed under the contract.

c. **Property Insurance (Builder's Risk/Installation Floater**)

The contractor shall purchase and maintain property insurance until final acceptance, upon the entire work at the site to the full insurable value thereof. This insurance shall include the interests of the owner, the contractor, the subcontractors and sub-subcontractors in the work and shall insure against the perils of fire, wind, rain, flood, extended coverage, and vandalism and malicious mischief. If the owner is damaged by failure of the contractor to purchase or maintain such insurance, then the contractor shall bear all reasonable costs properly attributable thereto; the contractor shall effect and maintain similar property insurance on portions of the work stored off the site when request for payment per articles so includes such portions.

d. **Deductible**

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

e. **Other Insurance**

The contractor shall obtain such additional insurance as may be required by the owner or by the General Statutes of North Carolina including motor vehicle insurance, in amounts not less than the statutory limits.

f. **Proof of Carriage**

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

ARTICLE 35 - PERFORMANCE BOND AND PAYMENT BOND

a. Each contractor shall furnish a performance bond and payment bond executed by a surety company authorized to do business in North Carolina. The bonds shall be in the full contract amount. Bonds shall be executed in the form bound with these specifications.

b. All bonds shall be countersigned by an authorized agent of the bonding company who is licensed to do business in North Carolina.

ARTICLE 36 - CONTRACTOR'S AFFIDAVIT

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

ARTICLE 37 - ASSIGNMENTS

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

ARTICLE 38 - USE OF PREMISES

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

b. The contractor(s) shall not load or permit any part of the structure to be loaded with a weight that will endanger its safety.

c. The contractor(s) shall enforce the designer's and owner’s instructions regarding signs, advertisements, fires and smoking.

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

ARTICLE 39 - CUTTING, PATCHING AND DIGGING

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

b. Any cost brought about by defective or ill-timed work shall be borne by the party responsible therefor.

c. No contractor shall endanger any work of another contractor by cutting, digging or other means. No contractor shall cut or alter the work of any other contractor without the consent of the designer and the affected contractor(s).

ARTICLE 40 - UTILITIES, STRUCTURES, SIGNS

a. The contractor shall provide necessary and adequate facilities for water, electricity, gas, oil, sewer and other utility services which maybe necessary and required for completion of the project including all utilities required for testing, cleaning, balancing, and sterilization of designated plumbing, mechanical and electrical systems. Any permanent

meters installed shall be listed in the contractor's name until work has a final acceptance. The contractor will be solely responsible for all utility costs prior to final acceptance. Contractor shall contact all affected utility companies prior to bid to determine their requirements to provide temporary and permanent service and include all costs associated with providing those services in their bid. Coordination of the work of the utility companies during construction is the sole responsibility of the contractor.

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

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

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

e. All contractors shall have the permanent building systems in sufficient readiness for furnishing temporary climatic control at the time a building is enclosed and secured. The HVAC systems shall maintain climatic control throughout the enclosed portion of the building sufficient to allow completion of the interior finishes of the building. A building shall be considered enclosed and secured when windows**,** doorways (exterior, mechanical, and electrical equipment rooms), and hardware are installed**;** and other openings have protection which will provide reasonable climatic control. The appropriate time to start the mechanical systems and climatic condition shall be jointly determined by the contractor(s), the designer and owner. Use of the equipment in this manner shall be subject to the approval of the Designer and owner and shall in no way affect the warranty requirements of the contractor(s).

f. The electrical contractor shall have the building's permanent power wiring distribution system in sufficient readiness to provide power as required by the HVAC contractor for temporary climatic control.

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

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

1. Prior to final acceptance of work by the State Construction Office, each contractor shall remove and replace any parts of the permanent building systems damaged through use during construction.

2. Temporary filters as recommended by the equipment manufacturer in order to keep the equipment and ductwork clean and free of dust and debris shall be installed in each of the heating and air conditioning units and at each return grille during construction. New filters shall be installed in each unit prior to the owner's acceptance of the work.

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

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

5. The electrical contractor shall have all lamps in proper working condition at the time of final project acceptance.

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

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

k. On multi-story construction projects, the Project Expediter shall provide temporary elevators, lifts, or other special equipment for the general use of all contractors. The cost for such elevators, lifts or other special equipment and the operation thereof shall be included in the Project Expediter's bid.

l. The Project Expediter will erect one sign on the project if required. The sign shall be of sound construction, and shall be neatly lettered with black letters on white background. The sign shall bear the name of the project, and the names of prime contractors on the project, and the name of the designer and consultants. Directional signs may be erected on the owner's property subject to approval of the owner with respect to size, style and location of such directional signs. Such signs may bear the name of the contractor and a directional symbol. No other signs will be permitted except by permission of the owner.

ARTICLE 41 - CLEANING UP

a. The contractors shall keep the building and surrounding area reasonably free from rubbish at all times, and shall remove debris from the site on a timely basis or when directed to do so by the designer or Project Expediter. The Project Expediter shall provide an on site refuse container(s) for the use of all contractors. Each contractor shall remove their rubbish and debris from the building on a daily basis. The Project Expediter shall broom clean the building as required to minimize dust and dirt accumulation.

b. The Project Expediter shall provide and maintain suitable all-weather access to the building.

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

ARTICLE 42 - GUARANTEE

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

b. Where items of equipment or material carry a manufacturer's warranty for any period in excess of twelve (12) months, then the manufacturer's warranty shall apply for that particular piece of equipment or material. The contractor shall replace such defective equipment or materials, without cost to the owner, within the manufacturer's warranty period.

c. Additionally, the owner may bring an action for latent defects caused by the negligence of the contractor which is hidden or not readily apparent to the owner at the time of beneficial occupancy or final acceptance, whichever occurred first, in accordance with applicable law.

d. Guarantees for roof, equipment, materials, and supplies shall be stipulated in the specifications sections governing such roof, equipment, materials, or supplies.

ARTICLE 43 - CODES AND STANDARDS

Wherever reference is given to codes, standard specifications or other data published by regulating agencies including, but not limited to, national electrical codes, North Carolina state building codes, federal specifications, ASTM specifications, various institute specifications, etc., it shall be understood that such reference is to the latest edition including addenda published prior to the date of the contract documents.

ARTICLE 44 - INDEMNIFICATION

To the fullest extent permitted by law, the contractor shall indemnify and hold harmless the owner, the designer and the agents, consultants and employees of the owner and designer, from and against all claims, damages, losses and expenses, including, but not limited to, attorneys' fees, arising out of or resulting from the performance or failure of performance of the work, provided that any such claim, damage, loss or expense (1) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the work itself) including the loss of use resulting there from, and (2) is caused in whole or in part by any negligent act or omission of the contractor, the contractor's subcontractor, or the agents of either the contractor or the contractor's subcontractor. Such obligation shall not be construed to negate, abridge or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this article.

ARTICLE 45 - TAXES

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

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

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

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

e. **Accounting Procedures for Refund of County Sales & Use Tax**

Amount of county sales and use tax paid per contractor's statements:

Contractors performing contracts for state agencies shall give the state agency for whose project the property was purchased a signed statement containing the information listed in G.S. 105-164.14(e).

The Department of Revenue has agreed that in lieu of obtaining copies of sales receipts from contractors, an agency may obtain a certified statement as of April 1, 1991 from the contractor setting forth the date, the type of property and the cost of the property purchased from each vendor, the county in which the vendor made the sale and the amount of local sales and use taxes paid thereon. If the property was purchased out-of-state, the county in which the property was delivered should be listed. The contractor should also be notified that the certified statement may be subject to audit.

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

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

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

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

Similar certified statements by his subcontractors must be obtained by the general contractor and furnished to the claimant.
Contractors are not to include any tax paid on supplies, tools and equipment which they use to perform their contracts and should include only those building materials, supplies, fixtures and equipment which actually become a part of or annexed to the building or structure.

ARTICLE 46 - EQUAL OPPORTUNITY CLAUSE

The non-discrimination clause contained in Section 202 (Federal) Executive Order 11246, as amended by Executive Order 11375, relative to equal employment opportunity for all persons without regard to race, color, religion, sex or national origin, and the implementing rules and regulations prescribed by the secretary of Labor, are incorporated herein.

ARTICLE 47 - EMPLOYMENT OF INDIVIDUALS WITH DISABILITIES

The contractor(s) agree not to discriminate against any employee or applicant for employment because of physical or mental disabilities in regard to any position for which the employee or applicant is qualified. The contractor agrees to take affirmative action to employ, advance in

employment and otherwise treat qualified individuals with such disabilities without discrimination based upon their physical or mental disability in all employment practices.

ARTICLE 48 - ASBESTOS-CONTAINING MATERIALS (ACM)

The State of North Carolina has attempted to address all asbestos-containing materials that are to be disturbed in the project. However, there may be other asbestos-containing materials in the work areas that are not to be disturbed and do not create an exposure hazard. Contractors are reminded of the requirements of instructions under Instructions to Bidders and General Conditions of the Contract, titled Examination of Conditions. Statute 130A, Article 19, amended August 3, 1989, established the Asbestos Hazard Management Program that controls asbestos abatement in North Carolina. The latest edition of *Guideline Criteria for Asbestos Abatement* from the State Construction Office is to be incorporated in all asbestos abatement projects for the Capital Improvement Program.

ARTICLE 49 - MINORITY BUSINESS PARTICIPATION

GS 143-128.2 establishes a ten percent (10%) goal for participation by minority businesses in total value of work for each State building project. The document, *Guidelines for Recruitment and Selection of Minority Businesses for Participation in State Construction Contracts* including Affidavits and Appendix E are hereby incorporated into and made a part of this contract.

ARTICLE 50 – CONTRACTOR EVALUATION

The contractor's overall work performance on the project shall be fairly evaluated in accordance with the State Building Commission policy and procedures, for determining qualifications to bid on future State capital improvement projects. In addition to final evaluation, interim evaluation may be prepared during the progress of project. The document, Contractor Evaluation Procedures, is hereby incorporated and made a part of this contract. The owner may request the contractor's comments to evaluate the designer.

ARTICLE 51 – GIFTS

Pursuant to N.C. Gen. Stat. § 133-32, it is unlawful for any vendor or contractor (i.e. architect, bidder, contractor, construction manager, design professional, engineer, subcontractor, supplier, vendor, etc.), to make gifts or to give favors to any State employee. This prohibition covers those vendors and contractors who: (1) have a contract with a governmental agency; or (2) have performed under such a contract within the past year; or (3) anticipate bidding on such a contract in the future. For additional information regarding the specific requirements and exemptions, vendors and contractors are encouraged to review G.S. Sec. 133-32.

During the construction of the Project, the Contractor is prohibited from making gifts to any of the Owner's employees, Owner's project representatives (architect, engineers, construction manager and their employees), employees of the State Construction Office and/or any other State employee that may have any involvement, influence, responsibilities, oversight, management and/or duties that pertain to and/or relate to the contract administration, financial administration and/or disposition of claims arising from and/or relating to the Contract and/or Project.

ARTICLE 52 – AUDITING-ACCESS TO PERSONS AND RECORDS

In accordance with N.C. General Statute 147-64.7, the State Auditor shall have access to Contractor's officers, employees, agents and/or other persons in control of and/or responsible for the Contractor's records that relate to this Contracts for purposes of conducting audits under the referenced statute. The Owner's internal auditors shall also have the right to access and copy the Contractor's records relating to the Contract and Project during the term of the Contract and within two years following the completion of the Project/close-out of the Contract to verify accounts, accuracy, information, calculations and/or data affecting and/or relating to Contractor's requests for payment, requests for change orders, change orders, claims for extra work, requests for time extensions and related claims for delay/extended general conditions costs, claims for lost productivity, claims for loss efficiency, claims for idle equipment or labor, claims for price/cost escalation, pass-through claims of subcontractors and/or suppliers, and/or any other type of claim for payment or damages from Owner and/or its project representatives.

ARTICLE 53 – NORTH CAROLINA FALSE CLAIMS ACT

The North Carolina False Claims Act ("NCFCA"), N.C Gen. Stat. § 1-605 through 1-618, applies to this Contract. The Contractor should familiarize itself with the entire NCFCA and should seek the assistance of an attorney if it has any questions regarding the NCFCA and its applicability to any requests, demands and/or claims for payment its submits to the State through the contracting state agency, institution, university or community college.

The purpose of the NCFCA "is to deter persons from knowingly causing or assisting in causing the State to pay claims that are false or fraudulent and to provide remedies in the form of treble damages and civil penalties when money is obtained from the State by reason of a false or fraudulent claim." (Section 1-605(b).) A contractor's liability under the NCFCA may arise from, but is not limited to: requests for payment, invoices, billing, claims for extra work, requests for change orders, requests for time extensions, claims for delay damages/extended general conditions costs, claims for loss productivity, claims for loss efficiency, claims for idle equipment or labor, claims for price/cost escalation, pass-through claims of subcontractors and/or suppliers, documentation used to support any of the foregoing requests or claims, and/or any other request for payment from the State through the contracting state agency, institution, university or community college. The parts of the NCFCA that are most likely to be enforced with respect to this type of contract are as follows:

- A "claim" is "[a]ny request or demand, whether under a contract or otherwise, for money or property and whether or not the State has title to the money or property that (i) is presented to an officer, employee, or agent of the State or (ii) is made to a contractor … if the money or property is to be spent or used on the State's behalf or to advance a State program or interest and if the State government: (a) provides or has provided any portion of the money or property that is requested or demanded; or (b) will reimburse such contractor … for any portion of the money or property which is requested or demanded." (Section 1-606(2).)

- "Knowing" and "knowingly." – Whenever a person, with respect to information, does any of the following: (a) Has actual knowledge of the information; (b) Acts in deliberate ignorance of the truth or falsity of the information; and/or (c) Acts in reckless disregard of the truth or falsity of the information. (Section 1-606(4).) Proof of specific intent to defraud is not required. (Section 1-606(4).)

- "Material" means having a natural tendency to influence, or be capable of influencing, the payment or receipt of money or property. (Section 1-606(4).)

- Liability. – "Any person who commits any of the following acts shall be liable to the State for three times the amount of damages that the State sustains because of the act of that person[:] … (1) Knowingly presents or causes to be presented a false or fraudulent claim for payment or approval. (2) Knowingly makes, uses, or causes to be made or used, a false record or statement material to a false or fraudulent claim. (3) Conspires to commit a violation of subdivision (1), (2) …" (Section 1-607(a)(1), (2).)

- The NCFCA shall be interpreted and construed so as to be consistent with the federal False Claims Act, 31 U.S.C. § 3729, et seq., and any subsequent amendments to that act. (Section 1-616(c).)

Finally, the contracting state agency, institution, university or community college may refer any suspected violation of the NCFCA by the Contractor to the Attorney General's Office for investigation. Under Section 1-608(a), the Attorney General is responsible for investigating any violation of NCFCA, and may bring a civil action against the Contractor under the NCFCA. The Attorney General's investigation and any civil action relating thereto are independent and not subject to any dispute resolution provision set forth in this Contract. (See Section 1-608(a).)

ARTICLE 54 – TERMINATION FOR CONVENIENCE

Owner may at any time and for any reason terminate Contractor's services and work at Owner's convenience. Upon receipt of such notice, Contractor shall, unless the notice directs otherwise, immediately discontinue the work and placing of orders for materials, facilities and supplies in connection with the performance of this Agreement.

Upon such termination, Contractor shall be entitled to payment only as follows: (1) the actual cost of the work completed in conformity with this Agreement; plus, (2) such other costs actually incurred by Contractor as are permitted by the prime contract and approved by Owner; (3) plus ten percent (10%) of the cost of the work referred to in subparagraph (1) above for overhead and profit. There shall be deducted from such sums as provided in this subparagraph the amount of any payments made to Contractor prior to the date of the termination of this Agreement. Contractor shall not be entitled to any claim or claim of lien against Owner for any additional compensation or damages in the event of such termination and payment.

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS AND GENERAL CONDITIONS OF THE CONTRACT

RELATION TO STANDARD FORMS

The Supplementary Instructions to Bidders and General Conditions of the Contract contain changes and additions to the "Instructions to Bidders and General Conditions of the Contract, Standard Form for Construction Projects, State Construction Office, North Carolina Department of Administration", Form OC-15, Twenty-fourth Edition, Revised March 2013. Where any portion of an Article in this document is modified or voided by the Supplementary General Conditions, the unaltered provisions shall remain in effect.

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

12 - SUBSTITUTIONS

Add sentence to the last paragraph to read:

"An addendum will be issued at least 7 days prior to the bid date, listing all approved substitutions. After the issuance of the substitution addendum, no further product substitutions will be made except under extenuating circumstances."

SUPPLEMENTARY GENERAL CONDITIONS OF THE CONTRACT

ARTICLE 6 - WORKING DRAWINGS AND SPECIFICATIONS AT THE JOB SITE

Add to Article 6, Paragraph "c" as follows: "Certification of final payment request will not be made by the Owner until record documents have been received from the Contractor".

ARTICLE 14 - CONSTRUCTION SUPERVISION

Modify Paragraph "e" to read "employ a registered land surveyor licensed in the State of North Carolina"…

Delete the second sentence of Paragraph "f" and substitute the following:

For this project the Single Prime Contractor (General Contractor) shall be designated as the "Project Expediter".

ARTICLE 23 - TIME OF COMPLETION, DELAYS, EXTENSIONS OF TIME

Change Article 23, Paragraph "b" to read:

b. The contractors shall commence work to be performed under this agreement on a date to be specified in a written order from the Owner and shall complete all work hereunder within **240 consecutive calendar days** of said date. For each day in excess of the above number of days, the Contractor(s) shall pay the Owner **Three hundred dollars ($300.00)** as liquidated damages reasonably estimated in advance to cover the losses to be incurred by the Owner by reason of failure of said Contractor(s) to complete the work within the time specified, such time being in the essence of this contract and a material consideration thereof.

ARTICLE 31 - REQUESTS FOR PAYMENT

Change the first part of the second sentence of Paragraph "a" to read:

The request shall be on the AIA Document G702 (1992) standard form for Application and Certificate for Payment supplemented by the Continuation sheet, AIA Document G703 (1992) and shall show . . . the following information:

ARTICLE 40 - UTILITIES, STRUCTURES, SIGNS

Delete the first three (3) sentences of Paragraph "l" of Article 40 and replace with the following:

l. The Project Expediter will erect one sign on the project at a location to be determined by the Owner. The sign shall be as detailed in Section 10 1400 – “Signage”, and shall be erected within 14 days of award of Contract.

ARTICLE 42 - GUARANTEE

Add to Paragraph "d" of Article 42 to read:

The CONTRACTOR shall warrant the materials and workmanship of the roofing system against leakage and against defects due to faulty materials, workmanship and contractor negligence for a period of two (2) years following acceptance of the project by the owner. Additionally, the roofing materials shall have a 20 year warranty covering defects in workmanship and materials per Section 13 3419 – “Metal Building Systems”.

ARTICLE 49 - MINORITY BUSINESS PARTICIPATION

The MBE Guidelines (GS143-128.2 Effective 1/1/2002) follow the Supplementary General conditions and the MBE Appendices follow the Form of Proposal at the end of this manual.

ARTICLE 51 - INDEX OF DRAWINGS

SHEET NO.	CONTENTS
T1	COVER SHEET, ABBREVIATIONS, LEGEND, LOCATION MAP, LIFE SAFETY PLAN
T2	BUILDING CODE SUMMARY
T3	BUILDING CODE SUMMARY, ADD ALTERNATE #1-TIRE STORAGE BLDG.
C1.0	EXISTING CONDITIONS/DEMOLITION PLAN
C2.0	SITE LAYOUT PLAN – ADD ALTERNATES #1, #2, #3, #4
C3.0	GRADING PLAN
C4.0	DETAILS
S1	FOOTING/FOUNDATION PLAN & DETAILS
S2	SECTION DETAILS
S3	CRANE AND MECH. PLATFORM PLAN
S4	ROOF FRAMING PLAN & DETAILS
S5	GENERAL NOTES & LINTEL SCHEDULE
S6	TIRE STORAGE BLDG. - ADD ALTERNATE. #1
A1.0	FLOOR PLAN, GENERAL NOTES, DETAILS
A1.1	REFLECTED CEILING PLAN, DETAILS
A1.2	ROOF PLAN, GENERAL NOTES, DETAILS
A2.0	EQUIPMENT PLAN & SCHEDULES
A3.0	BUILDING ELEVATIONS
A4.0	BUILDING & WALL SECTIONS
A5.0	WALL SECTIONS
A6.0	DOOR, DOOR FRAMES & WINDOW ELEVATIONS, SCHEDULES
A7.0	INTERIOR ELEVATIONS, ENLARGED PLANS, DETAILS
A8.0	TIRE STORAGE BUILDING, ADD ALTERNATE #1
P1	FLOOR PLAN-PLUMBING WASTE & DETAILS
P2	FLOOR PLAN-PLUMBING WASTE
P3	FLOOR PLAN-AIR PIPING & DETAILS
P4	FIXTURE SCHEDULE & DETAILS
P5	PLUMBING OIL INTERCEPTOR, COMP. AIR SCHEMATIC
M1	GROUND FLOOR PLAN & DETAILS- HVAC
M2	UPPER LEVEL PLAN, DETAILS-HVAC
M3	DETAILS-HVAC

M4 SCHEDULES, APP. B -HVAC

NDEX OF DRAWINGS CONT'D

E1 GROUND FLOOR PLAN & NOTES-ELECTRICAL
E2 GROUND FLOOR PLAN & NOTES-LIGHTING
E3 LIGHTING PLAN
E4 ELECTRICAL UPPER CEILING PLAN (HVAC)
E5 ELECTRICAL FIXTURE SCHED. & PANEL DIAG.- ADD ALTERNATE. #5
E6 ELECTRICAL MOUNTING HEIGHTS, WIRING DETAILS
PME.1 TIRE STORAGE BULIDING-HVAC & ELECTIRCAL- ADD. ALTERNATE #1

GUIDELINES FOR RECRUITMENT AND SELECTION OF MINORITY BUSINESSES FOR PARTICIPATION IN STATE CONSTRUCTION CONTRACTS

In accordance with G.S. 143-128 (SB 308 ratified June 28, 1989) these guidelines establish goals for minority participation in single-prime and separate-prime state construction contracts. The legislation provided 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 guidelines are published to accomplish that end.

SECTION 1: 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 for participation by minority businesses in each construction project as mandated by SB 308. Nothing contained in these guidelines shall be considered to require awarding authorities to award contracts or to make purchases of materials or equipment from minority-business contractors who do not submit the lowest responsible bid or bids.

SECTION 2: 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 or Alaskan Native, 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; and
   b. Of which the management and daily business operations are controlled by one or more of the minority persons who own it.
3. Owner - The State of North Carolina, through the Agency/Institution named in the contract.
4. Bidder - Any person, firm, partnership, corporation, association, or joint venture seeking to be awarded a public contract or subcontract.
5. 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.
6. 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.
7. Subcontractor - A firm under contract with the prime contractor for supplying materials or labor and materials and/or installation. The subcontractor may or may not provide materials in his subcontract.
   Work subcontracted in an emergency and which could not have been anticipated is excluded as a part of this program.

8. Verifiable goal means:
   a. For purposes of separate-prime contract system, that the awarding authority has adopted written guidelines specifying the actions that will be taken to ensure a good faith effort in the recruitment and selection of minority businesses for participation in contracts awarded; and
   b. For purposes of single-prime contract system, that the awarding authority has adopted written guidelines specifying the actions that the prime contractor must take to ensure a good faith effort in the recruitment and selection of minority businesses for participation in contracts awarded; the required actions must be documented in writing by the contractor to the appropriate awarding authority.

Section 3: RESPONSIBILITIES

1. *Minority Business Program of the Division of Purchase & Contract, Department of Administration (hereafter referred to as Minority Business Program).*
   The Minority Business Program will establish a program pursuant to which it shall certify to interested persons, businesses qualifying as Minority Business Enterprises (MBE). The information solicited from the applicant will be used by the *Minority Business Program* to:
   a. Determine MBE certification, i.e. that those certified are MBEs under GS 143-128 as a contractor and/or subcontractor.
   b. Identify those areas of work for which there are certified MBEs, as requested.
   c. Provide interested parties with a list of prospective certified MBE contractors and subcontractors.
   d. Assist in the determination of technical assistance in the certification program that needs to be provided.

   In addition to being responsible for the certification of those small and emerging businesses that want to participate in the state construction program, the Minority Business Program will:
      (1) Maintain a current list of certified MBEs and furnish the State Construction Office an updated list of those certified. The list furnished shall include the areas of work in which each MBE is interested.
      (2) From information furnished by the State Construction Office publicize the contracting and subcontracting opportunities available for each state construction project being advertised.
      (3) Work with the North Carolina Association of Minority Businesses, the Carolinas Branch AGC, t*he Carolinas Electrical Contractors Association and the North Carolina Association of Plumbing-Heating-Cooling Contractors* in developing and implementing a certification program intended to improve the ability of MBEs to compete in this program.

2. State Construction Office
   The State Construction Office will be responsible for the following:
   a. For contracts in excess of $500,000 in estimated cost, furnish to the *Minority Business Program and* the Minority Business Development Agency of the Department of Economic & Community Development 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.

   The twenty-one day advance time period may be reduced to ten days for contracts in the range of $100,000 to $500,000 in the estimated cost.

b. The prebid conference, if scheduled, conducted by the representative of the owner, will be open to all known and anticipated prime contractors, subcontractors, material suppliers, and other bidders. During the conference, this program, including the bidders' responsibilities, will be fully explained.

c. Reviewing the apparent low bidders' compliance with the items listed in the proposal that must be complied with if the bid is to be considered as responsive. The State reserves the right to reject any or all bids and to waive informalities.

3. Owner

Under the separate-prime contract system, the owner will:

a. Attend the scheduled prebid conference.

b. Identify or determine those work areas of a contract where MBEs may have an interest in performing contract work.

c. At least ten (10) days prior to the scheduled day of bid opening the owner will notify certified MBEs of potential contracting opportunities listed in the proposal. The notification will 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 agency/institution 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) certified MBEs in the general locality of the project who offer similar contracting or subcontracting services in the specific trade, the owner shall notify three (3), but may contact more, if the owner so desires.

d. Maintain documentation of any contacts, correspondence or conversation with MBE firms made in an attempt to meet the goals.

4. Prime Contractor(s)

Under the single-prime contract system and the separate prime contract system, the prime contractor(s) will:

a. Attend the scheduled prebid conference.

b. Identify or determine those work areas of a subcontract where MBEs may have an interest in performing subcontract work.

c. At least ten (10) days prior to the scheduled day of bid opening, notify certified MBEs 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) certified MBEs 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. Submit with the bid a description of that portion of the work to be executed by MBEs expressed as a percentage of the total contract price.

f. Upon being named the apparent low bidder, the Bidder shall provide the necessary documentation as listed in the contract documents. Failure to comply with procedural requirements as defined in contract documents may render that bid as nonresponsive and

may result in rejection of the bid and award to the next lowest responsible and responsive bidder.

g. During the construction of a project, if it becomes necessary to replace an MBE subcontractor, advise the owner, State Construction Office and the Governor's Special Assistant of the circumstances involved.

h. If during the construction of a project additional subcontracting opportunities become available, make a good faith effort to solicit subbids from MBEs.

5. Governor's Special Assistant on Minority Affairs

The Governor's Special Assistant on Minority Affairs ("Governor's Special Assistant") has agreed to be responsible for overseeing this MBE program by:

a. Monitoring compliance with the program requirements.

b. Assisting in the implementation of technical assistance programs.

c. Reporting the results of this MBE program through the State Construction Office to the Secretary of the Department of Administration, the Secretary of Economic & Community Development, the Governor and the General Assembly.

6. MBE Responsibilities

While MBEs are not required to become certified in order to participate in this program, it is recommended that they become certified and should take advantage of the appropriate technical assistance that is made available. In addition, MBEs 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 between an agency and another person that involves a person's rights, duties or privileges, should be settled through informal procedures. To that end, MBE disputes arising under these guidelines should be resolved, if possible, by informal proceedings arranged by the Governor's Special Assistant for Minority Affairs and the Director of the State Construction Office.

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, Ste. 450, NC Education Building, Raleigh, North Carolina, 27601-2827, phone (919) 733-7962.

Section 6: In addition to these guidelines, there will be issued with each construction bid package guideline provisions for contractual compliance providing MBE participation in the state construction program.

REPORT OF SUBSURFACE EXPLORATION
AND
GEOTECHNICAL ENGINEERING EVALUATION

WAGRAM EQUIPMENT BUILDING
LAURINBURG, NORTH CAROLINA
ECS PROJECT No: 33-3043

Prepared For

NCDOT

Prepared By

NOVEMBER 25, 2014

November 25, 2014

Mrs. Lisa L. Keel, RA, AIA
Architect, Facilities Design
NCDOT
1525 Mail Service Center
Raleigh, North Carolina 27699-1525

Reference: Report of Subsurface Exploration and Geotechnical Engineering Evaluation
Wagram Equipment Shop
23161 Airbase Road
Laurinburg, Scotland County, North Carolina

Dear Ms. Keel:

As authorized by your acceptance of our proposal number 33-2045, dated August 28, 2014, ECS has completed the subsurface exploration and geotechnical engineering evaluation for the above referenced project. This report contains the results of our subsurface exploration, as well as our recommendations concerning the geotechnical design and const ruction aspects of the project.

We appreciate the opportunity to be of continued service to you, and we look forward to our continued involvement during the construction of this project . If you have any questions concerning the information and recommen dations presented in this report, or if we can be of further assistance, please do not hesitate to contact us.

Sincerely,
ECS CAROLINAS, LLP represented by;

25 Nov 14

Scott G. Dowell, P.E.
Branch Manager/Vice President

Winslow Goins, P.E.
Principal Engineer

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1.0 EXECUTIVE SUMMARY

This report contains the results of our subsurface exploration and geotechnical engineering evaluation for the construction of a new 10,100 square foot equipment shop facility. The building will house the transportation maintenance staff at the Wagram yard. The structure will consist of a slab-on-grade foundation, concrete masonry walls, utility brick veneer, pre-manufactured steel superstructure and metal roofing. Also included in the project will be the construction of a detached 1,000 square foot tire storage building. This storage building will be slab-on-grade, load-bearing CMU walls and a wood truss roof.

Within the borings, approximately 2.5 to 8 feet of fill was encountered at the surface, which included asphalt debris. Beneath the fill materials, Coastal Plain soils were encountered within the borings until their termination depths. The Coastal Plain soils typically classified as relatively clean sand (SP, SP-SC, SP-SM), sandy lean clay (CL), and clayey/silty sand (SC, SM) with N-values ranging from 5 to 33 bpf.

Groundwater was encountered within the borings at depths ranging from approximately 10 to 12 feet at the time of our exploration. Boring cave-in depths ranged from 11.5 to 13 feet below the existing ground surface.

Provided the subgrade preparation and earthwork operations are completed in strict accordance with the recommendations of this report, the proposed constructions can be supported on conventional shallow foundations bearing on approved natural residual soils or new engineered fill. Shallow foundations bearing on natural coastal plain soils or new engineered fill may be designed a net allowable bearing pressure of 2,000 pound per square foot (psf). Concrete slabs-on-grade can be designed using a modulus of subgrade reaction of 150 pounds per cubic inch (pci).

Due to the encountered large size asphalt debris, we recommend that the foundations be undercut 2 to 5 feet below the bottom of footing elevation, especially near Borings B-3, B-7, and B-8. The undercut areas can be replaced with compacted structural fill or washed stone (No. 57 stone). Undercutting of the slab subgrade should also be anticipated near Boring B-3. Delineation of these areas should be performed during construction.

Specific information regarding the field and laboratory testing, the site and subsurface conditions at the time of our exploration, and our conclusions and recommendations concerning the geotechnical design and construction aspects of the project are discussed in detail in the subsequent sections of this report. Please note this Executive Summary is an important part of this report and may not be relied upon exclusive of the entire report. The subsequent sections of this report constitute our findings, conclusions, and recommendations in their entirety.

2.0 PROJECT OVERVIEW

2.1 Project Information

We understand that the project will consist of the construction of a new 10,100 square foot equipment shop facility. The building will house the transportation mainten ance staff at the Wagram yard. The structure will consist of a slab -on-grade foundation, concrete masonry walls, utility brick veneer, pre-manufactured steel superstructure and metal roofing. Also included in the project will be the construction of a det ached 1,000 square foot tire storage building. This storage building will be slab-on-grade, load-bearing CMU walls and a wood truss roof.

2.2 Scope of Work

The conclusions and recommendations contained in this report are based on the results of the following:

- Eight standard penetration test (SPT) borings within the proposed building locations.
- Visual examination of the samples obtained during our field exploration,
- The results of select laboratory index and engineering properties testing, and
- Engineering analyses of the field findings with respect to the provided project information

2.3 Purposes of Exploration

The purpose of this exploration program was to determine the soil and groundwater conditions at the site and to develop engineering recommend ations to assist in the design and construction of the proposed project. We accomplished these objectives as follows:

- Performing a site reconnaissance to evaluate the existing site conditions and detail boring locations,
- Performing borings to explore the subsurface soil and groundwater conditions, and
- Analyzing the field data to develop appropriate geotechnical engineering design and construction recommendations

3.0 EXPLORATION PROCEDURES

3.1 Soil Test Borings

Eight soil test borings, (B-1 to B-8) were drilled at the approximate locations shown on the Boring Location Diagram included in the Appendix of this report. Soil test borings were advanced to a depth of approximately 15 to 25 feet below the prevailing ground surface within the footprint area of the proposed building. The boring locations were established in the field by ECS personnel by estimating distances and angles from existing site features and are approximate. Individual Soil Boring Logs are included in Appendix I.

The soil test borings were performed using a truck-mounted drill rig utilizing continuous-flight, hollow stem augers to advance the boreholes. Drilling fluid was not used in this process. Representative soil samples were obtained by means of the split-barrel sampling procedure in conformance with ASTM D 1586. In this procedure, a 3.25-inch O.D., split-barrel sampler is driven into the soil a distance of 18 inches by a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler through a 12-inch interval is termed the Standard Penetration Test (SPT) value and is indicated for each sample on the boring logs. This value can be used as a qualitative indication of the in-place relative density of cohesionless soils. In a less reliable way, it also indicates the consistency of cohesive soils. This indication is qualitative, since many factors can significantly affect the Standard Penetration resistance value and prevent a direct correlation between drill crews, drill rigs, drilling procedures, and hammer-rod-sampler assemblies. Split-spoon samples were obtained at approximately 2 ½-foot intervals within the upper 10 feet of the borings and at 5-foot intervals thereafter.

The drilling crew maintained a field log of the soils encountered in the borings. After recovery, each sample was removed from the sampler and visually classified. Representative portions of each recovered sample were then sealed in air-tight containers and brought to our laboratory in Fayetteville, North Carolina for visual examination by a geotechnical engineer in accordance with Unified Soil Classification System.

4.0 SITE AND SUBSURFACE CONDITIONS

4.1 Site Observations

The subject site is located at 23161 Airbase Road in Laurinburg, North Carolina . Currently the site is a soil stockpile yard and chain link fence surrounds the property. The site is relatively level, not considering the stockpiles, and appears to match the surrounding properties. Highway 401 (Wagram Road) bounds the site to the southeast and Airbase Road is located on the southwestern edge of the site. The NCDOT Maintenance Facility is situated to the northwest of the subject site and an old grocery store is located to the northeast.

4.2 Area Geology

The referenced site is located within the Coastal Plain Pr ovince of North Carolina. The Coastal Plain Province is a broad flat plain with widely spaced low rolling hills where the near surface soils have their origin from the deposition of sediments several million years ago during the period that the ocean rece ded from this area to its present location along the Atlantic Coast. It is noted that the Coastal Plain soils vary in thickness from only a few feet along the western border to over ten thousand feet in some areas along 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.

It is important to note that the natural geology in portions of the site have been modified in the past by the placement of fill materials when the facility was constructed. The quality of man-made fills can vary significantly, and it is often diffi cult to assess the engineering properties of fill. Furthermore, there is no specific correlation between N -values from standard penetration tests performed in soil test borings and the degree of compaction of existing fill soils . However, a qualitative a ssessment of existing fills can sometimes be made based on the N -values obtained and observations of the materials sampled in the test borings. W e recommend that the client obtain copies of any available in-place density test results for any fill placed at the site. The test results should be forwarded to ECS so that we can further evaluate the overall suitability of the fill and its impact on the proposed construction.

4.3 Subsurface Conditions

Within the borings, approximately 2.5 to 8 feet of fill w as encountered at the surface, which included asphalt debris. Beneath the fill materials, Coastal Plain soils were encountered within the borings until their termination depths. The Coastal Plain soils typically classified as relatively clean sand (SP, SP -SC, SP-SM), sandy lean clay (CL), and clayey/silty sand (SC, SM) with N-values ranging from 5 to 33 bpf.

Groundwater was encountered within the borings at depths ranging from approximately 10 to 12 feet at the time of our exploration. Boring cave-in depths ranged from 11.5 to 13 feet below the existing ground surface.

Please note that variations in the location of the static water table may occur as a result of changes in precipitation, evaporation, surface water runoff, absorption, and other factors not immediately apparent at the time of this exploration. Consequently, fluctuations in the elevation of the groundwater table should be expected. In general, the highest groundwater levels typically occur in late winter and spring, while the lowest levels typically occur in summer and fall. Due to the fine grained near-surface fill soils encountered, we anticipate that a perched water condition could occur.

The above paragraphs provide a general summary of the subsurface conditions encountered at the site at the time of our exploration. The Boring Logs included in Appendix I contain detailed information regarding the subsurface conditions encountered at each boring location. These Boring Logs represent our visual classification of the samples retrieved during the field exploration. The stratification lines on the Boring Logs designate approximate boundaries between various subsurface strata. The actual in-situ transitions are expected to be more gradual. Conditions intermediate of the actual boring locations may also differ.

4.4 Laboratory Test Results

Index and engineering properties tests were performed on select soil samples encountered within the borings.

The grain size analysis indicated that the tested samples had 26.4 and 36.2 percent fines passing the number 200 sieve.

The Atterberg limits analyses indicated that the tested samples had plastic limits of 17 and 23, liquid limits of 30 and 37, and plasticity index values of 13 and 14, respectively.

Specific laboratory test results are provided in the Laboratory Testing Summary in the Appendix of this report.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The borings performed at this site represent the subsurface conditions at the location of the borings. Due to inconsistencies associated with the prevailing geology, there can be changes in the subsurface conditions over relatively short distances that have not been disclosed by the results of the test location performed. Consequently, there may be undisclosed subsurface conditions that require special treatment or additional preparation once these conditions are revealed during construction.

Our evaluation of foundation support conditions has been based on our understanding of the site, project information and the data obtained in our exploration. The general subsurface conditions utilized in our foundation evaluation have been based on interpolation of subsurface data between and away from the borings. In evaluating the boring data, we have examined previous correlations between penetration resistance values and foundation bearing pressures observed in soil conditions similar to those at your site.

5.1 Site and Subgrade Preparation

Site preparation should commence with the demolition and removal any existing structures and associated foundations, asphalt and concrete pavements, and the clearing and stripping of all vegetation, topsoil, debris, deleterious materials, and any other soft or unsuitable materials from the existing ground surface. These operations should extend at least 10 feet beyond the limits of the planned building construction, where practical. The existing stone may be left in – place to provide a working surface and to protect the subgrade soils.

Abandoned underground utilities within the proposed building areas should be removed including bedding and backfill materials. Excavations resulting from underground utility removal should be backfilled with structural fill. Pockets of trapped water could be encountered in utility trench excavations and during the removal of underground structures and should be promptly removed. Pumping from a sump pit located within the excavation should be an effective method of controlling such groundwater seepage. Soft wet soils remaining in the bottoms of excavations should be undercut and removed to establish firm subgrade conditions prior to backfilling. The undercut areas should be backfilled with compacted structural fill.

Since the site is already developed, fill soils should be anticipated under existing structures and pavements, even though the borings did not encounter fill. Additional exploration consisting of test pits, handauger/DCP, probing should be performed during contruction.

Once the site is cleared, stripped, and densified as outlined above, we recommend that areas at grade and areas to be filled be proofrolled. The proofrolling should be accomplished using a loaded dump truck having an axle weight of at least 10 tons or rubber-tired equipment of similar weight and tire pressures. The proofrolling should be observed by an experienced geotechnical engineer, or his representative, at the time of construction to aid in identifying any areas with soft or unsuitable materials. Repair of soft or unsuitable areas may include densification of loose sands, under cutting, moisture conditioning, and re-compacting; stone stabilization; stabilization using geosynthetic material; a combination of activities; or other

measures that may be appropriate. The ECS geotechnical engineer should determine the most appropriate remedial method at the time of construction.

The preparation of fill subgrades, as well as the proposed building or pavement subgrades, should be observed on a full -time basis by ECS personnel. These observations should be performed by an experienced geo technical engineer, or his re presentative, to ensure that unsuitable materials have been removed and that the prepared subgrade is suitable for support of the proposed construction and/or fills.

The soils at this site will deteriorate when exposed during inclement weather. The exposed subgrades should be sealed and sloped to promote surface runoff and reduce the ponding of water. When rainfall is anticipated during g rading operations, we recommend that areas of disturbed soil be sealed using a smooth d rum roller or rubber -tired equipment to help reduce the infiltration of water and grading activities cease until the site has had a chance to dry. Water that may accumulate in the footing excavations as a result of rainfall or surface water runoff should be immediately removed. Loosened or disturb ed materials at the base of footing excavations should be removed prior to the placement of reinforcing steel or concrete.

Grading operations at this site should be more economical if performed during the drier periods of the year (typically April to October). During the drier periods of the ye ar, wet soils may be dried by using discing operations or other drying procedures to obtain moisture conten ts necessary to achieve required degrees of compaction. In the warmer summer months, wetting of the soils may be necessary to achieve the required degree of compaction. Regardless, the earthwork contractor shall maintain the site soils within their working range of optimum, otherwise significant undercutting may be required.

5.2 Engineered Fill

Following the removal of soft or otherwise unsuitable surface and subsurface features, and after achieving a competent subgrade, the contractor can place and compact approved, controlled engineered fill to achie ve the desire d site grades. The fill for support of the proposed construction and backfill for utility lines within the building and pavement limits should consist of an approved material, free of organic matter and debris. The fill materials should have a plasticity index less than 20 and a liquid limit less than 50. We also recommend that fills within structural areas have a modified Proctor (ASTM D 1557) maximum dry density of at least 105 pounds per cubic foot (pcf). The majority of the near -surface soils appear suitable for re-use as engineered fill provided they can be properly moisture conditioned.

Prior to the commencement of fill operations and/or utilization of any off -site borrow materials, the contractor should provide representative samples of the soi l materials to the geotechnical engineer. The geotechnical engineer will determine the material's suitability for use as an engineered fill and develop moisture -density relationships in accordance with the recommendations provided herein. Samples should be provided to the geotec hnical engineer at least 3 days prior to their use in the field to allow for the appropriate laboratory testing to be performed.

Mass areas of engineered fill placed within the building and pavement areas should be placed in lifts not exceeding 8 inches in loose lift thickness and moisture conditioned to within their working range of optimum moisture content, and compacted to a minimum of 95 percent of their modified Proctor maximum dry density, as determined in accordance with A STM D 1557. Similarly, isolated areas of engineered fill, such as trench backfill, should be placed in lifts not exceeding 6 inches and moisture conditioned as mentioned above. The typical working range of moisture is typically within approximately 3 percent of the optimum moisture content.

The footprint of the proposed building area should be well defined during fill placement. Grade controls should also be maintained through out the filling operations. The filling operations should be observed on a full-time basis by an experienced soils engineering technician to determine that the required degrees of compaction are being achieved. Due to the relatively small site area, we recommend that a minimum of one compaction test per 2,500 -square-foot area, or fraction thereof, be performed for each lift of controlled fill. W e also recommend at least one test per lift for every 100 linear feet of utility trench, or fraction thereof. The elevation and location of the tests should be accurately identified at t he time of fill placement. Areas which fail to achieve the required degree of compaction should be re -compacted and re-tested until the required compaction is achieved. Failing test areas may require moisture adjustments or other suitable remedial activities in order to achieve the required compaction.

Fill materials should not be placed on frozen soils or frost -heaved soils and/or soils which have been recently subjected to precipitation. Borrow fill materials should not contain wet or frozen materials at the time of placement. W et or frost -heaved soils should be removed prior to placement of engineered fill, granular sub -base materials, foundation or slab concrete, and asphalt pavement materials.

If problems are encountered during the site grading o perations, or if the actual site conditions differ from those encountered during our subsurface exploration, ECS should be notified immediately.

5.3 Foundations

Provided the subgrade preparation and earthwork operations are completed in accordance with the “Site and Subgrade Preparation” sections of this report, the proposed construction can be supported on conventional shallow foundations bearing on approved natural soils or new engineered fill. Shallow foundations supported on approved natural soils and new engineered fill may be proportioned for a net allowable design bearing pressure of 2,000 psf. To help reduce the possibility of foundation bearing failure and excessive settlement due to local shear or "punching" failures, we recommend that continu ous footings have a minimum width of 18 inches and that isolated column footings have a minimum lateral dimension of 30 inches. W e recommend the bearing elevation for all foundations be a minimum depth of 18 inches below the finished exterior grade.

Due to the encountered large size asphalt debris, we recommend that the foundations be undercut 2 to 5 feet below the bottom of footing elevation, especially near Borings B -3, B-7, and B-8. The undercut areas can be replaced with compacted structural fill or washed stone (No. 57 stone).

The settlement of a structure is a function of the compressibility of the bearing materials, bearing pressure, actual structural loads, fills depths, and the bearing elevation of footings with respect to the final ground surface elevation. Estimates of settlement for foundations bearing on engineered fills are strongly dependent on the quality of fill placed. Factors which may affect the quality of fill include maximum loose lift thickness of the fills placed and the amount of compactive effort placed on each lift. Provided the recommendations outlined in this report are strictly adhered to, we expect total settlements for the proposed construction to be approximately 1 inch, while the differential settlement will be approximately ½ of the anticipated total settlement. This evaluation is based on our engineering experience and the anticipated loadings for this type of structure, and is intended to aid the structural engineer with his design.

Exposure to the environment may weaken the soils at the foundation bearing level if the foundation excavations remain exposed during periods of inclement weather. Therefore, foundation concrete should be placed the same day that proper excavation is achieved and the design bearing pressure verified. If the bearing soils are softened by surface water absorption or exposure to the environment, the softened soils must be removed from the foundation excavation bottom prior to placement of concrete. If the foundation excavation must remain open overnight, or if inclement weather is expected while the bearing soils are exposed, we recommend that a 2 to 3-inch thick "mud mat" of "lean" concrete be placed over the exposed bearing soils before the placement of reinforcing steel.

The net allowable soil bearing pressure refers to that pressure which may be transmitted to the foundation bearing soils in excess of the final minimum surrounding overburden pressure. The final footing elevation should be evaluated by ECS personnel to verify that the bearing soils are capable of supporting the recommended net allowable bearing pressure and suitable for foundation construction. These evaluations should include visual observations, hand rod probing, and dynamic cone penetrometer (ASTM STP-399) testing in each column footing excavation and at intervals not greater than 25 feet in continuous footing excavations. The dynamic cone penetrometer testing should be conducted in hand auger boreholes at 1 foot intervals to a depth equal to at least ¾ B (where B equals the footing width) in isolated column footing excavations and to at least 1½ B in bearing wall footing excavations; or to a depth at least 4 feet below the bearing elevation of the planned footings, whichever is greater. The importance of these evaluations cannot be overemphasized as the site has been filled.

5.4 Concrete Slabs-On-Grade

For the design and construction of the slab-on-grade for the proposed buildings, a design modulus of subgrade reaction value of 150 pci is appropriate for design provided the subgrades are properly prepared. Due to the encountered near-surface asphalt debris, undercutting of the slab subgrade of depths up to 3 feet should be anticipated near Boring B-3.

We also recommend the slabs-on-grade be underlain by a minimum of 4 inches of granular material having a maximum aggregate size of 1½ inches and no more than 2 percent fines. Prior to placing the granular material, the floor subgrade soil should be properly compacted, unyielding during a final proofroll, and free of standing water, mud, and frozen soil. A properly designed and constructed capillary break layer can often eliminate the need for a moisture

retarder and can assist in more uniform curing of concrete. If a vapor retarder is considered to provide additional moisture protection, special attention should be given to the surface curing of the slabs to minimize uneven drying of the slabs and associated cracking and/or slab curling. The use of a blotter or cushion layer above the vapor retarder can also be considered for project specific reasons. Please refer to ACI 302.1R96 *Guide for Concrete Floor and Slab Construction* and ASTM E 1643 *Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs* for additional guidance on this issue.

We recommend that the floor slab be isolated from the foundations so differential settlement of the structure will not induce shear stresses on the floor slab. Also, in order to help minimize the crack width of a ny shrinkage cracks that may develop near the surface of the slab, we recommend mesh reinforcement as a minimum be included in the design of the floor slab. For maximum effectiveness, temperature and shrinkage reinforcements in slabs on ground should be positioned in the upper third of the slab thickness. The W ire Reinforcement Institute recommends the mesh reinforcement be placed 2 inches below the slab surface or upper one -third of slab thickness, whichever is closer to the surface. Adequate constructio n joints, contraction joints and isolation joints should also be provided in the slab to reduce the impacts of cracking and shrinkage. Please refer to ACI 302.1R96 *Guide for Concrete Floor and Slab Construction* for additional information regarding concrete slab joint design.

5.5 Site Drainage

Positive drainage should be provided around the perimeter of the building to minimize the potential for moisture infiltration into the foundation and/or subgrade soils. W e recommend that landscaped areas adjacent to these structures be sloped away from the construction and maintain a fall of at least 6 inches for the first 10 feet outward from the structures. Similarly, all roof drains should release a sufficient distance from the building perimeter or discharge directly into underground stormwater piping . Sidewalks and paved areas should also be sloped to divert surface water away from the proposed building.

5.6 General Construction Considerations

It is imperative to maintain good site drainage during earthwork o perations to help maintain the integrity of the surface soils. The surface of the site should be kept properly graded to enhance drainage of surface water away from the proposed construction areas during the earthwork phase of this project. W e recommend that surface drainage be diverted away from the proposed building without significantly interrupting its flow. Other practices would involve crowning and sealing the exposed soils daily with a smooth -drum roller at the end of the day's work to reduce the potential for infiltration of surface water into the exposed soils.

The key to minimizing disturbance problems with the soils is to have proper control of the earthwork operations. Specifically, it should be the earthwork contractor's responsibility to maintain the site soils within a workable moisture content range to obtain the required in -place density and maintain a stable subgrade. Scarifying and drying operations should be included in the contractor's price and not be considered an extra to the con tract. In addition, construction equipment cannot be permitted to randomly run across the site, especially once

the desired final grades have been established. Construction equipment should be limited to designated lanes and areas, especially during wet periods to minimize disturbance of the site subgrades.

6.0 CLOSING

This report has been prepared in accordance with generally accepted geotechnical engineering practice. No other warranty is expressed or implied. No third party may rely upon this report without prior written approval from ECS. The recommendations presented in this report are based on our understanding of the site and project info rmation provided by the client, and the data obtained during our exploration. The general subsurface con ditions utilized in our evaluations are based on interpolation of subsurface conditions between the borings. In evaluating the subsurface data, we have considered previous correlations between penetration resistance values and engineering properties for soil conditions similar to those at your site. The discovery of any site or subsurface conditions during construct ion which deviate from those described herein should be reported to us for our evaluation. Furthermore, ECS shall be provided with final proj ect drawings and specifications prior to construction to verify that our recommendations have been correctly interpreted. Any required revisions to the recommendations contained herein shall be made in writing by ECS prior to construction.

APPENDIX I

Site Vicinity Plan

Boring Location Plan

Unified Soil Classification System

Reference Notes for Boring Logs

Boring Logs B-1 through B-8

Laboratory Testing Summary

Unified Soil Classification System
(ASTM Designation D-2487)

Major Division		Group Symbol	Typical Names	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	$C_u = D_{60}/D_{10}$ 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

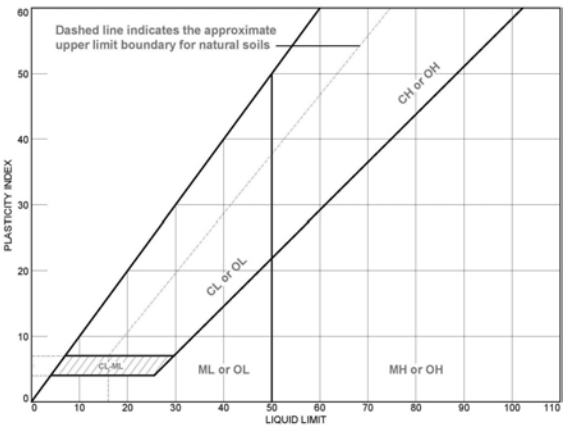
Classification on basis of percentage of fines

Less than 5% Pass No. 200 sieve — GW, GP, SW, SP

More than 12% Pass No. 200 sieve — GM, GC, SM, SC

5% to 12% Pass No. 200 sieve — Borderline classification requiring use of dual symbol

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

REFERENCE NOTES FOR BORING LOGS

I. Drilling and Sampling Symbols:

SS:	Split Spoon Sampler	RB:	Rock Bit Drilling
ST:	Shelby Tube Sampler	BS:	Bulk Sample of Cuttings
RC:	Rock Core; NX, BX, AX	PA:	Power Auger (no sample)
PM:	Pressuremeter	HSA:	Hollow Stem Auger
DC:	Dutch Cone Penetrometer	WS:	Wash Sample

Standard Penetration (Blows/Ft) refers to the blows per foot of a 140 lb. hammer falling 30 inches on a 2 inch O.D. split spoon sample, as specified in ASTM D-1586. The blow count is commonly referred to as the N value.

II. Correlation of Penetration Resistances to Soil Properties:

Relative Density of Cohesionless Soils

SPT-N	Relative Density
0 - 4	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
51 or more	Very Dense

Consistency of Cohesive Soils

SPT-N	Consistency
0 - 2	Very Soft
3 - 4	Soft
5 - 8	Medium Stiff
9 - 15	Stiff
16 - 30	Very Stiff
31 - 50	Hard
50 or more	Very Hard

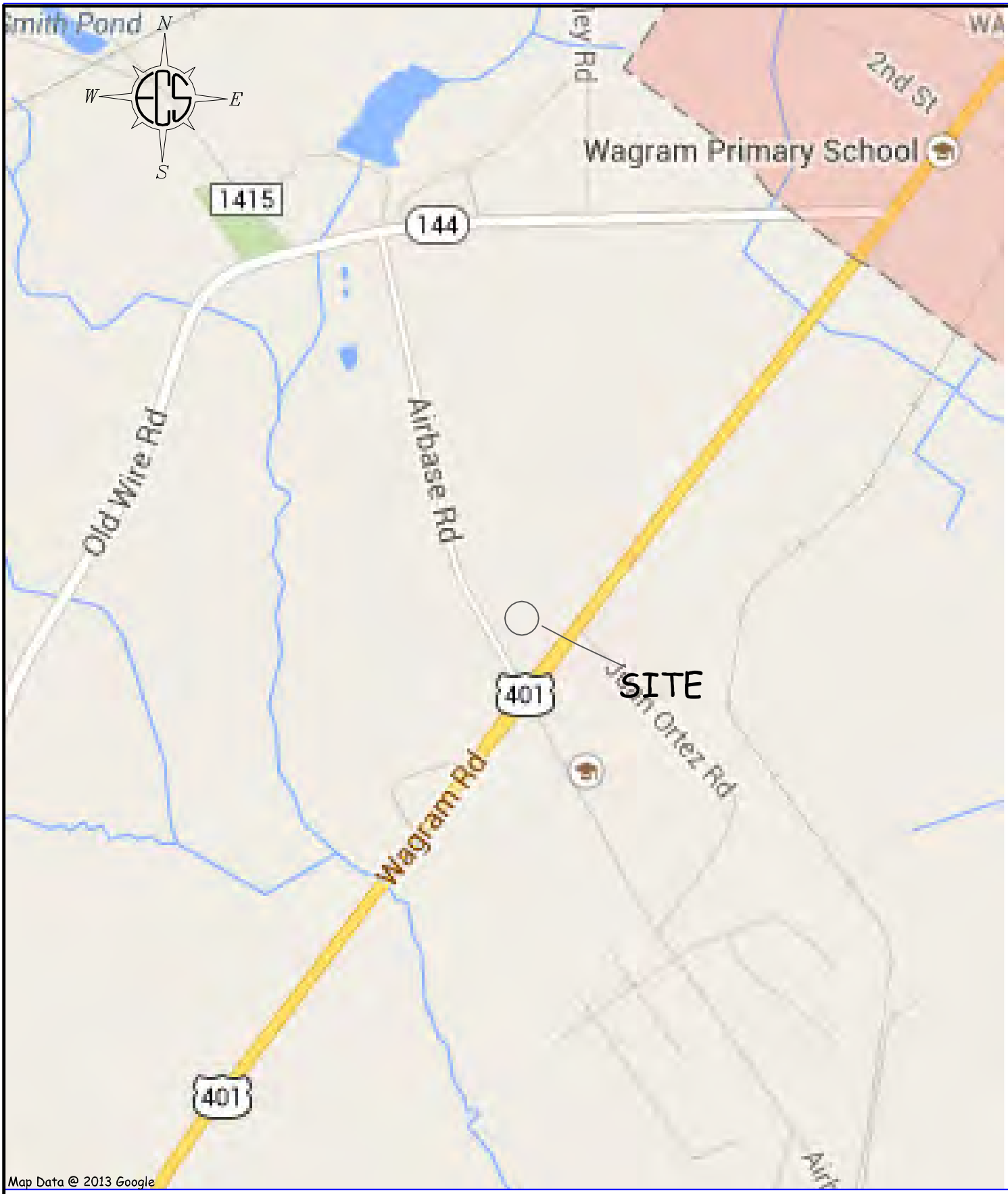
III. Unified Soil Classification Symbols:

GP:	Poorly Graded Gravel	ML:	Low Plasticity Silts
GW:	Well Graded Gravel	MH:	High Plasticity Silts
GM:	Silty Gravel	CL:	Low Plasticity Clays
GC:	Clayey Gravel	CH:	High Plasticity Clays
SP:	Poorly Graded Sands	OL:	Low Plasticity Organics
SW:	Well Graded Sands	OH:	High Plasticity Organics
SM:	Silty Sands	CL - ML:	Dual Classification (Typical)
SC:	Clayey Sands		

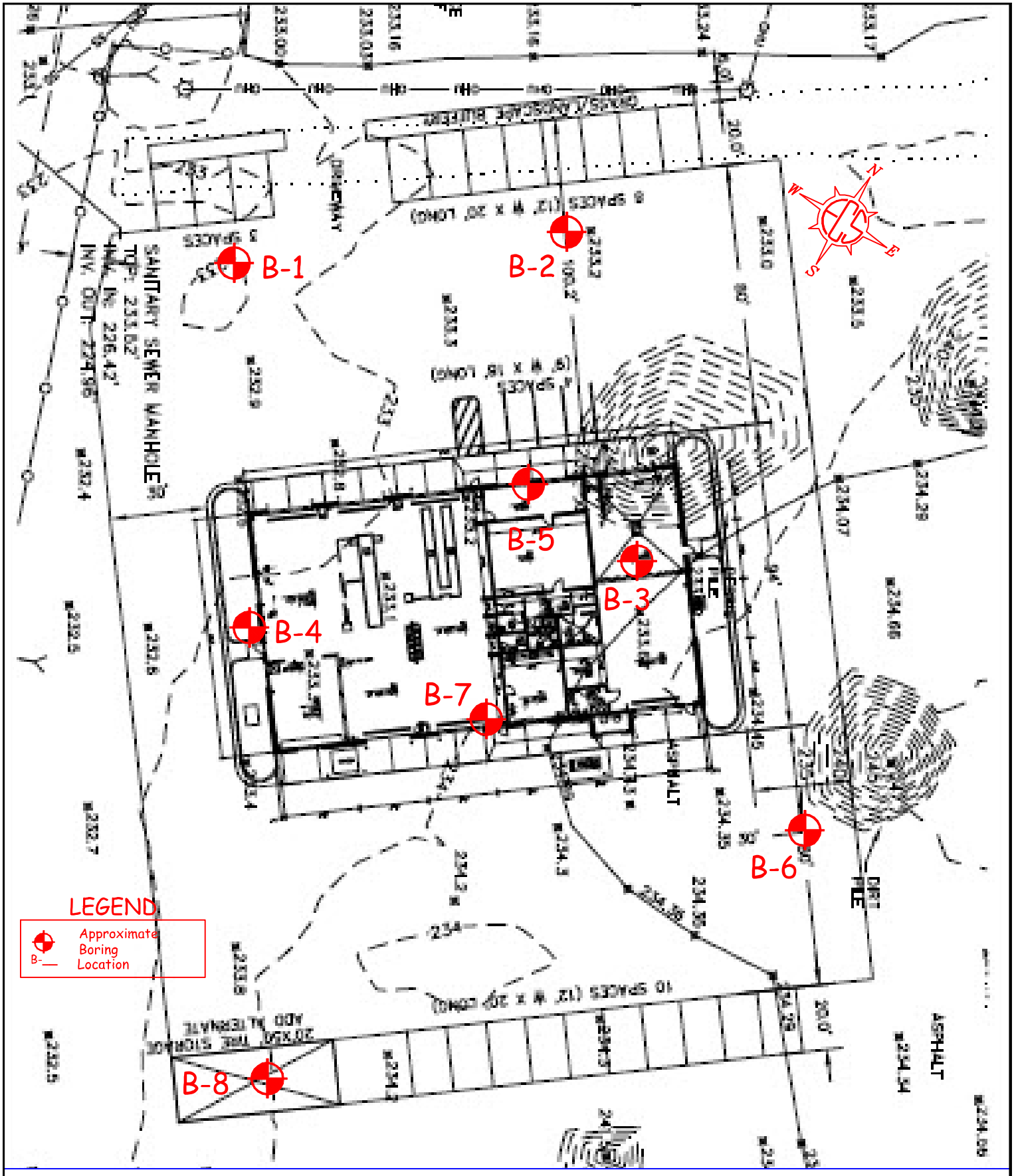
IV. Water Level Measurement Symbols:

WL:	Water Level	BCR:	Before Casing Removal
WS:	While Sampling	ACR:	After Casing Removal
WD:	While Drilling	WCI:	Wet Cave In
		DCI:	Dry Cave In

The water levels are those water levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when auguring, without adding fluids, in a granular soil. In clays and plastic silts, the accurate determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally applied.



Site Vicinity Plan **NCDOT**	ECS	**Proposed Equipment Building** **Division 8, District 3** **Wagram, NC**	ENGINEER SGD DRAFTSMAN WMA REVISIONS	SCALE N.T.S. PROJECT NO. 33:3034 SHEET Fig.1 DATE 10/08/2014



Boring Location Plan

NCDOT

ECS

Proposed Equipment Building

Division 8, District 3

Wagram, NC

ENGINEER SGD	SCALE N.T.S.
DRAFTSMAN WMA	PROJECT NO. 33:3043
REVISIONS	SHEET Fig.2
	DATE 09/30/14

CLIENT	JOB #	BORING #	SHEET
NC Department of Transportation	3043	B-1	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Wagram Equipment Shop - WBS#45511.5	

SITE LOCATION: 23161 Airbase Road, Laurinburg, NC

NORTHING | EASTING | STATION

CALIBRATED PENETROMETER TONS/FT²

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

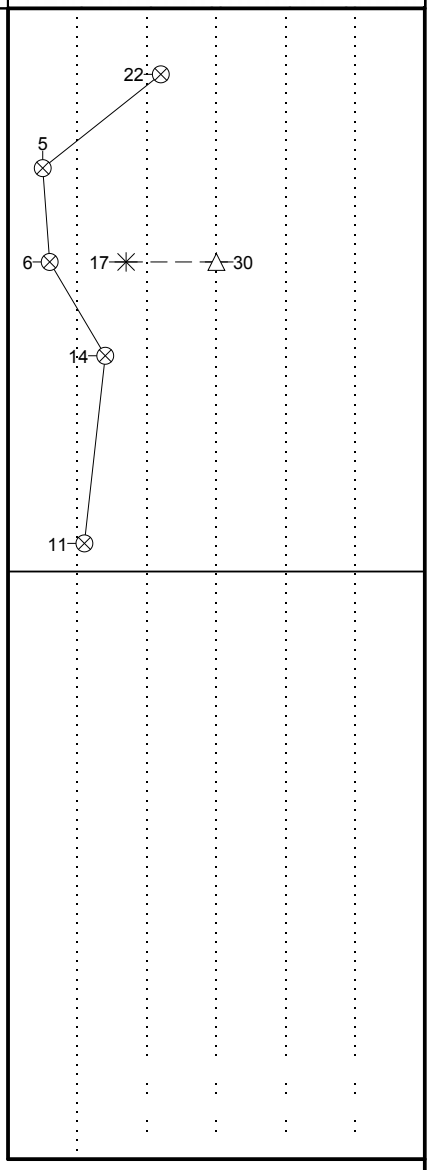
STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					(SP-SC FILL) SAND WITH CLAY, Orange, Tan, Moist, Medium Dense			7 8 14
	S-1	SS	18	18				
					(DEBRIS FILL)			
					(SC) CLAYEY FINE TO MEDIUM SAND, Orange, Tan, Moist, Loose			3 2 3
	S-2	SS	18	18				
5								
	S-3	SS	18	18				3 3 3
	S-4	SS	18	18	(SP) COARSE SAND, Gray, Tan, Moist, Medium Dense			5 6 8
10						▽		
					(SP) FINE TO MEDIUM SAND, Tan, White, Wet, Medium Dense			
	S-5	SS	18	18				5 5 6
15					END OF BORING @ 15.00'			
20								
25								
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

▽ WL 10.5 WS ☐ WD ☐	BORING STARTED 10/03/14	
▽ WL(BCR) ▽ WL(ACR)	BORING COMPLETED 10/03/14	CAVE IN DEPTH
▽ WL	RIG CME 45 FOREMAN	DRILLING METHOD

CLIENT	JOB #	BORING #	SHEET
NC Department of Transportation	3043	B-2	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Wagram Equipment Shop - WBS#45511.5	

SITE LOCATION: 23161 Airbase Road, Laurinburg, NC

NORTHING | EASTING | STATION

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

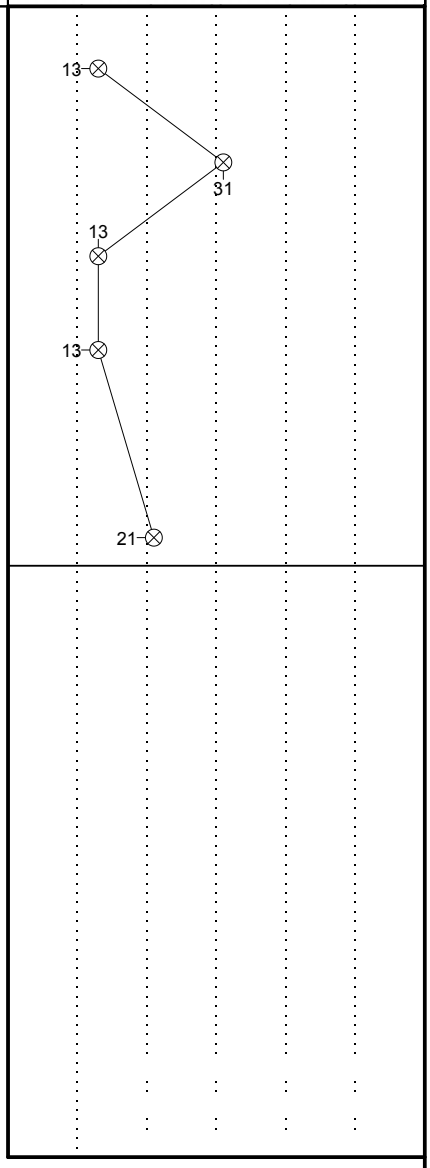
PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION | SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					(SP FILL) COARSE SAND, Brown, Moist, Medium Dense			7 6 7
	S-1	SS	18	18				
					(DEBRIS FILL), Contains Significant Asphalt, Black			16 15 16
	S-2	SS	18	18				
5								
	S-3	SS	18	18	(DEBRIS FILL), Contains Significant Asphalt, Black			16 7 6
					(SP) FINE TO MEDIUM SAND, Orange, Tan, Moist, Medium Dense	▽		8 7 6
	S-4	SS	18	18				
10								
					(SP) COARSE SAND, Tan, White, Wet, Medium Dense			7 10 11
	S-5	SS	18	18				
15					END OF BORING @ 15.00'			
20								
25								
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

▽ WL 10.00 WS ☐ WD ☐	BORING STARTED 10/03/14	
▽ WL(BCR) ▼ WL(ACR)	BORING COMPLETED 10/03/14	CAVE IN DEPTH @ 11.50'
▽ WL	RIG CME 45 FOREMAN S. Bowman	DRILLING METHOD 2.25" HSA

CLIENT	JOB #	BORING #	SHEET
NC Department of Transportation	3043	B-3	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Wagram Equipment Shop - WBS#45511.5	

SITE LOCATION: 23161 Airbase Road, Laurinburg, NC

NORTHING | EASTING | STATION

CALIBRATED PENETROMETER TONS/FT²

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

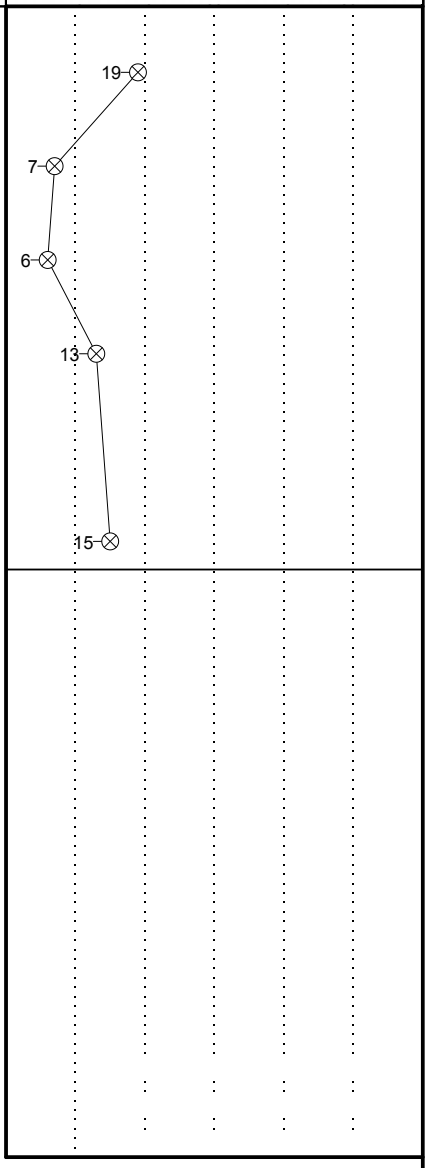
PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION | SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					(SP FILL) FINE TO MEDIUM SAND, Contains Asphalt, Brown, Black, Moist, Medium Dense			14 9 10
	S-1	SS	18	18				
					(SP) FINE TO MEDIUM SAND, Orange, Tan, Moist, Loose			3 3 4
5	S-2	SS	18	18				
	S-3	SS	18	18	(SP) FINE TO MEDIUM SAND, Orange, Moist, Loose			3 3 3
					(SP) FINE TO MEDIUM SAND, Orange, Tan, Moist, Medium Dense			7 7 6
10	S-4	SS	18	18		▽		
					(SP) FINE TO MEDIUM SAND, Tan, White, Wet, Medium Dense			4 6 9
	S-5	SS	18	18				
15					END OF BORING @ 15.00'			
20								
25								
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

▽ WL 10.70 WS ☐ WD ☐	BORING STARTED 10/03/14	
▽ WL(BCR) ▼ WL(ACR)	BORING COMPLETED 10/03/14	CAVE IN DEPTH @ 11.50'
▽ WL	RIG CME 45 FOREMAN S. Bowman	DRILLING METHOD 2.25"HSA

CLIENT	JOB #	BORING #	SHEET
NC Department of Transportation	3043	B-4	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Wagram Equipment Shop - WBS#45511.5	

SITE LOCATION: 23161 Airbase Road, Laurinburg, NC

NORTHING | EASTING | STATION

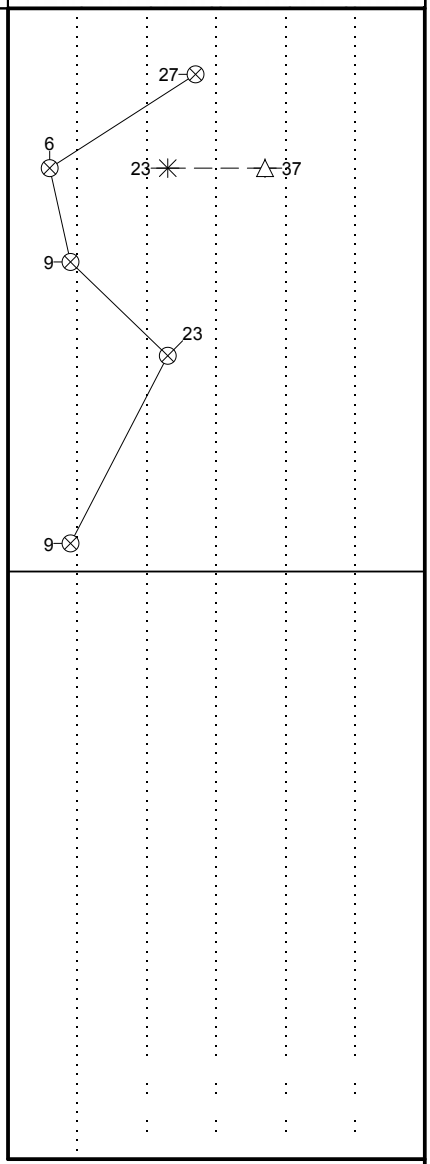
CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL (ENGLISH UNITS; BOTTOM OF CASING; LOSS OF CIRCULATION; SURFACE ELEVATION)	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					(SP-SC FILL) SAND WITH CLAY, Orange, Brown, Moist, Medium Dense			8 12 15
	S-1	SS	18	18				
					(SC) CLAYEY FINE TO MEDIUM SAND, Orange, Moist, Loose			2 3 3
	S-2	SS	18	18				
5								
	S-3	SS	18	18	(SP-SC) FINE TO MEDIUM SAND WITH CLAY, Tan, Moist, Loose			3 4 5
					(SP) COARSE SAND, Trace Gravel, Gray, Moist, Medium Dense			9 11 12
	S-4	SS	18	18				
10								
					(SP-SC) MEDIUM TO COARSE SAND WITH CLAY, Orange, Tan, Wet, Loose			3 3 6
	S-5	SS	18	18				
15					END OF BORING @ 15.00'			
20								
25								
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 11.00 WS ☐ WD ☐	BORING STARTED 10/03/14	
WL(BCR) WL(ACR)	BORING COMPLETED 10/03/14	CAVE IN DEPTH @ 11.50'
WL	RIG CME 45 FOREMAN S. Bowman	DRILLING METHOD 2.25" HSA

CLIENT	JOB #	BORING #	SHEET
NC Department of Transportation	3043	B-5	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Wagram Equipment Shop - WBS#45511.5	

SITE LOCATION: 23161 Airbase Road, Laurinburg, NC

NORTHING | EASTING | STATION

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

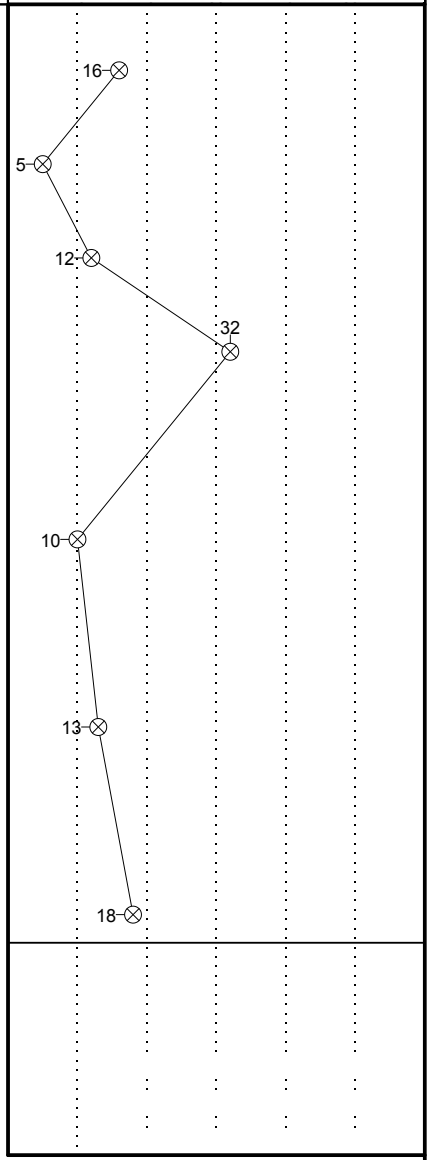
PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION | SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	18	18	(SM/SC FILL) SILTY/CLAYEY FINE TO MEDIUM SAND, Orange, Tan, Brown, Moist, Medium Dense			4 8 8
	S-2	SS	18	18	(SP) FINE TO MEDIUM SAND, Tan, Orange, Moist, Loose			2 2 3
5	S-3	SS	18	18	(SC) CLAYEY FINE TO MEDIUM SAND, Tan, Moist, Medium Dense			4 5 7
	S-4	SS	18	18	(SP) COARSE SAND, Orange, Moist, Dense to Loose			6 15 17
					(CL) LEAN CLAY, Gray, White, Moist, Hard			
10					(SP) COARSE SAND, Orange, Moist, Dense	▽		
	S-5	SS	18	18				4 4 6
15					(CL) LEAN CLAY, White, Moist, Stiff			
	S-6	SS	18	18				3 5 8
20					(SP) COARSE SAND, Tan, Wet, Medium Dense			
	S-7	SS	18	18				5 8 10
25					END OF BORING @ 25.00'			
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

▽ WL 11.80 WS ☐ WD ☐	BORING STARTED 10/03/14	
▽ WL(BCR) ▼ WL(ACR)	BORING COMPLETED 10/03/14	CAVE IN DEPTH @ 12.50'
▽ WL	RIG CME 45 FOREMAN S. Bowman	DRILLING METHOD 2.25" HSA

CLIENT	JOB #	BORING #	SHEET
NC Department of Transportation	3043	B-6	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Wagram Equipment Shop - WBS#45511.5	

SITE LOCATION: 23161 Airbase Road, Laurinburg, NC

NORTHING | EASTING | STATION

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

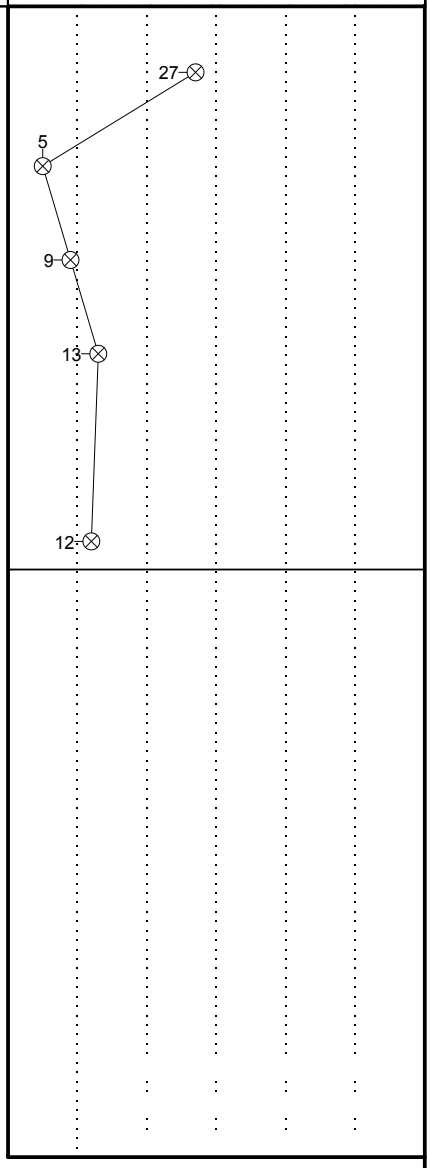
PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION | SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					(SP-SM FILL) FINE TO MEDIUM SAND WITH SILT, Brown, Black, Moist, Medium Dense			14 14 13
	S-1	SS	18	18				
					(SP-SC) MEDIUM SAND WITH CLAY, Orange, Moist, Loose			2 2 3
5	S-2	SS	18	18				
					(SP-SC) MEDIUM TO COARSE SAND WITH CLAY, Orange, Moist, Loose			3 4 5
	S-3	SS	18	18				
					(SP) MEDIUM SAND, Orange, Moist, Medium Dense			6 7 6
10	S-4	SS	18	18		▽		
					(SP) COARSE SAND, Tan, White, Wet, Medium Dense			5 6 6
	S-5	SS	18	18				
15					END OF BORING @ 15.00'			
20								
25								
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

▽ WL 11.50 WS ☐ WD ☐	BORING STARTED 10/03/14	
▽ WL(BCR) ▼ WL(ACR)	BORING COMPLETED 10/03/14	CAVE IN DEPTH @ 11.50'
▽ WL	RIG CME 45 FOREMAN S. Bowman	DRILLING METHOD 2.25" HSA

CLIENT	JOB #	BORING #	SHEET
NC Department of Transportation	3043	B-7	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Wagram Equipment Shop - WBS#45511.5	

SITE LOCATION: 23161 Airbase Road, Laurinburg, NC

NORTHING | EASTING | STATION

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

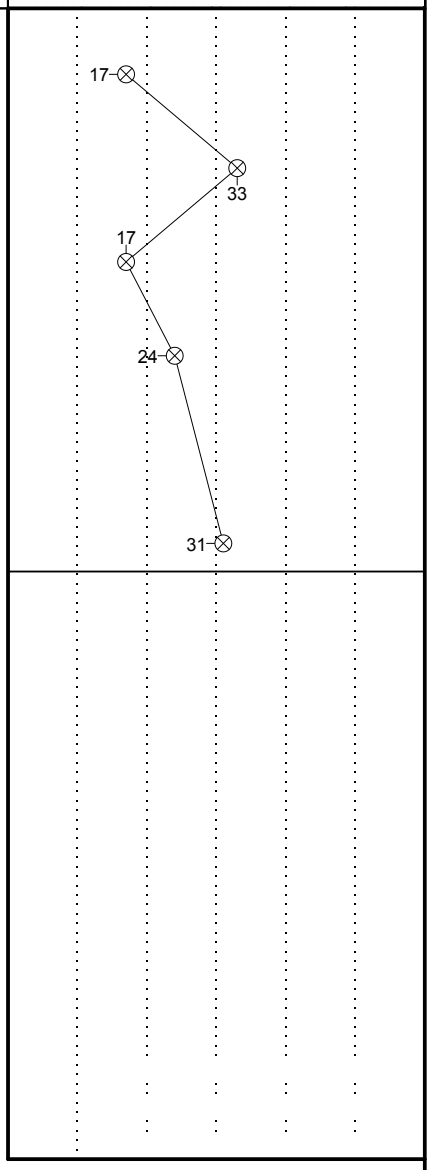
PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION | SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					(SC FILL) CLAYEY FINE TO MEDIUM SAND, Gray Brown, Moist, Medium Dense			10 9 8
	S-1	SS	18	18				
					(SM FILL) SILTY FINE TO MEDIUM SAND, Contains Asphalt, Black, Moist, Dense to Medium Dense			14 16 17
5	S-2	SS	18	18				
	S-3	SS	18	18				6 8 9
					(SP) MEDIUM TO COARSE SAND, Tan Orange, Moist, Medium Dense			
	S-4	SS	18	18				6 11 13
10					(SP-SM) FINE TO MEDIUM SAND WITH SILT, Gray White, Wet, Medium Dense to Dense	▽		
	S-5	SS	18	18				18 18 13
15					END OF BORING @ 15.00'			
20								
25								
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

▽ WL 12.00 WS ☐ WD ☐	BORING STARTED 11/03/14	
▽ WL(BCR) ▼ WL(ACR)	BORING COMPLETED 11/03/14	CAVE IN DEPTH @ 12.42'
▽ WL	RIG CME 45 FOREMAN S. Bowman	DRILLING METHOD 2.25" HSA

CLIENT	JOB #	BORING #	SHEET
NC Department of Transportation	3043	B-8	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Wagram Equipment Shop - WBS#45511.5	

SITE LOCATION: 23161 Airbase Road, Laurinburg, NC

NORTHING | EASTING | STATION

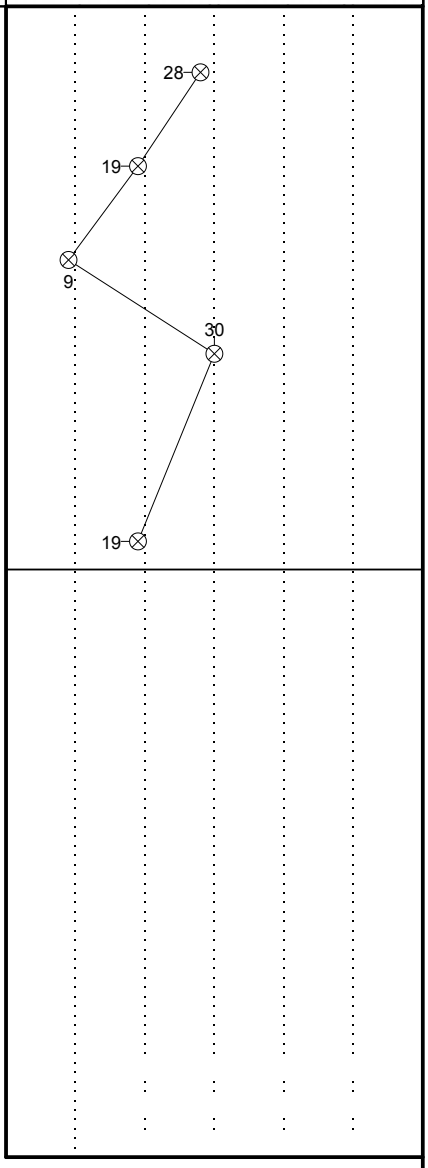
CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL (ENGLISH UNITS; BOTTOM OF CASING; LOSS OF CIRCULATION; SURFACE ELEVATION)	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					(SP-SM FILL) FINE TO MEDIUM SAND WITH SILT, Gray Tan, Moist, Medium Dense			9 13 15
	S-1	SS	18	18				
					(SM FILL) SILTY FINE TO MEDIUM SAND, Contains Asphalt, Black, Moist, Medium Dense			9 11 8
	S-2	SS	18	18				
5					(SM) SILTY FINE SAND, Gray Brown, Moist, Medium Dense			3 4 5
	S-3	SS	18	18	(SP-SM) FINE TO MEDIUM SAND WITH SILT, Tan, Moist, Loose			
					(SC) CLAYEY FINE TO MEDIUM SAND, Red Brown, Moist, Medium Dense			6 13 17
	S-4	SS	18	18				
10					(SP) MEDIUM TO COARSE SAND, Brown Tan, Wet, Medium Dense			6 8 11
	S-5	SS	18	18				
15					END OF BORING @ 15.00'			
20								
25								
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL WS☐ WD☐	BORING STARTED 11/03/14	
WL(BCR) WL(ACR)	BORING COMPLETED 11/03/14	CAVE IN DEPTH @ 13.00'
WL	RIG CME 45 FOREMAN S. Bowman	DRILLING METHOD 2.25" HSA

Laboratory Testing Summary

Sample Source	Sample Number	Depth (feet)	MC[1] (%)	Soil Type[2]	Atterberg Limits[3]			Percent Passing No. 200 Sieve[4]	Moisture - Density (Corr.)[5]		CBR Value[6]	Other
					LL	PL	PI		Maximum Density (pcf)	Optimum Moisture (%)		
B-1												
	S-3	6.00 - 7.50		SC	30	17	13	26.4				
B-4												
	S-2	3.50 - 5.00		SC	37	23	14	36.2				

Notes: 1. ASTM D 2216, 2. ASTM D 2487, 3. ASTM D 4318, 4. ASTM D 1140, 5. See test reports for test method, 6. See test reports for test method

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content (ASTM D 2974)

Project No. 3043
Project Name: Wagram Equipment Shop - WBS#45511.5
PM: Scott Garland Dowell
PE: Scott Garland Dowell
Printed On: Sunday, November 23, 2014

ECS CAROLINAS, LLP
726 Ramsey St., Suite 3
Fayetteville, NC 28301
Phone: (910) 401-3288
Fax: (910) 323-0539

SECTION 011000 SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: Wagram Equipment Shop

B. Owner's Name: North Carolina Department of Transportation.

C. Architect's Name: William N. Gardner AIA, NCARB.

D. The Project is the construction of a new equipment shop of 9748 sq ft..
   1. The pre-engineered metal building has painted concrete masonry exterior walls, painted concrete masonry interior walls, metal roofing, soffit and fascia panels, concrete floor slabs at work bays, finished office areas, plumbing, mechanical and electrical building systems (including utility connections). Work includes finish grading of the site, concrete curbs, aprons, and asphalt paving.
   2. See Documents for Equipment Schedule and location of Owner Furnished Contractor installed equipment including a bridge crane, and pieces of equipment that plug in which are also Owner Furnished.
      a. The Owner's vendor will install two vehicle floor lifts provided by the Owner in floor pits built by the Contractor. Contractor to provide utility piping and air piping for the lifts.
      b. For the Owner Furnished Owner Installed emergency generator, the Contractor is responsible for building the concrete pad and providing all electrical connections, as well as the transfer switch.
      c. Contractor's work includes installing communications conduit to the building for the Owner's IT department to use to install voice and data fiber. The Owner is responsible for installing communications cabling, hardware, software, and final terminations.
   3. See Section 01 2300 Alternates for Add Alternates for the 1,000 square foot Tire Storage Building, for various amounts of Parking Lot asphalt paving and for LED Lighting alternate.
   4. See Section 01 2100 Quantity Allowances
   5. See Section 01 2200 Unit Prices.

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price as described in Notice to Bidders; one contract will encompass the building and all site work.

1.03 OWNER OCCUPANCY

A. NC DOT intends to occupy the Project upon Final Acceptance..

B. Contractor shall cooperate with NC DOT to minimize conflict and to facilitate NC DOT's operations.

1.04 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas as noted on Civil Drawing C2.0, "Limits of Construction"..

B. Provide access to and from site as required by law and by NC DOT:
   1. Do not obstruct roadways, sidewalks, or other public ways without permit.

C. Utility Outages and Shutdown:
   1. Prevent accidental disruption of utility services to other facilities.
   2. Coordinate necessary shut-offs with NC DOT.

1.05 WORK SEQUENCE

A. Coordinate construction schedule and operations with Architect.

END OF SECTION

SECTION 012000 PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Procedures for preparation and submittal of application for final payment.

1.02 SCHEDULE OF VALUES

A. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.

B. Forms filled out by hand will not be accepted.

1.03 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

C. Forms filled out by hand will not be accepted.

D. Execute certification by signature of authorized officer.

E. Submit five originals of each Application for Payment.

F. Include the following with the application:
   1. State of North Carolina County Sales and Use Tax Report- use the form provided in the end of this section.

1.04 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 01 7000.

END OF SECTION

SECTION 012100 – QUANTITY ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

B. Types of allowances include the following:

1. Quantity Allowances.

C. Related Requirements:

1. Section 01 2200 "Unit Prices" for procedures for using unit prices.

1.2 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

1.3 INFORMATIONAL SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.4 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.5 QUANTITY ALLOWANCES

A. Allowance shall include cost to the Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include freight**,** and delivery to Project site.

B. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.6 TESTING AND INSPECTING ALLOWANCES

A. Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results.

B. The allowance does not include incidental labor required to assist the testing agency or costs for retesting if previous tests and inspections result in failure. The cost for incidental labor to assist the testing agency shall be included in the Contract Sum.

C. Costs of services not required by the Contract Documents are not included in the allowance.

D. At Project closeout, credit unused amounts remaining in the testing and inspecting allowance to Owner by Change Order.

1.7 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.

1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Allowance Quantity No. 1: Remove Unsuitable Soils: Include the quantity of 200 cubic yards for removal of unsuitable soils as outlined in Specification Section 01 2200 – Unit Price No. 1.

1. This allowance includes excavation of unsuitable material and disposal off site.
2. Coordinate quantity allowance adjustment with corresponding unit-price requirements in Section 012200 "Unit Prices."

B. Allowance Quantity No. 2: Geotextile Fabric: Include the quantity of 315 Square Yards: Included for the installation of engineered fill as outlined in Specification Section 012200 – Unit Price No. 2.

1. This allowance includes material cost, receiving, handling, and installation as part of soils remediation recommendation by an Agent of the owner.
2. Coordinate quantity allowance adjustment with corresponding unit-price requirements in Section 012200 "Unit Prices."

END OF SECTION 012100

SECTION 01 2200 - UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for unit prices.

B. Related Requirements:

1. Section 01 2100 "Quantity Allowances" for procedures for addressing quantity allowances.

1.2 DEFINITIONS

A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.3 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, overhead, and profit.

B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

A. Unit Price No. I: - Excavation of Unsuitable Soils. Unit price to be provided by General Contractor on Bid Proposal Form.

1. Description: The excavation of material, where authorized or directed, below or in addition to the levels required for the Work. Dispose of excavated material in an approved location on site. Backfill with imported structural fill material compacted per specifications. The quantity of unsuitable soils is to be determined by an Agent of the Owner.
2. Unit of Measurement: Cubic Yard.
3. Quantity Allowance: Coordinate unit price with allowance adjustment requirements in Section 01 2100 "Allowances."

B. Unit Price No. 2 – Geotextile Fabric: Unit price to be provided by General Contractor on Bid Proposal Form.

1. Description: Installation of RS580i or equal geotextile fabric where authorized or directed. Credit or additions to the contract price for actual quantities installed shall be made per the Unit prices contained in the Bid Form. Geotextile fabric and engineered fill is recommended by an Agent of the Owner.
2. Unit of Measurement: Square Yards.
3. Quantity Allowance: Coordinate unit price with allowance adjustment requirements in Section 01 2100 "Allowances."

END OF SECTION 012200

SECTION 01 2300 ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Description of Alternates.

1.02 RELATED REQUIREMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division 1 Specifications Sections, apply to this section.

1.03 ACCEPTANCE OF ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at NC DOT's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.

1.04 SCHEDULE OF ALTERNATES

A. Alternate No. 1 - Construct 1000 sq. ft. Tire Storage Building with 10' concrete apron.:
   1. Base Bid Item: Drawing numbers include but are not limited to: T3.0, C2.0, S6 & A8.0, PME-1.

B. Alternate No. 2 - Provide pavement at Area 1 (Front of Shop) in lieu of gravel base bid as shown on C2.0.:
   1. Base Bid Item: Drawing number C2.0: 6" crusher run gravel on compacted subgrade.

C. Alternate No. 3 - Provide pavement at Area 1 (Front of Shop) and Area 2 (Side Driveways) as shown on C2.0.:
   1. Base Bid Item: Drawing number C2.0: 6" crusher run gravel on compacted subgrade.

D. Alternate No. 4 - Provide pavement at Area 1 (Front of Shop), Area 2 (Side Driveways), and Area 3 (Back of Shop) in lieu of gravel base bid as shown on C2.0.:
   1. Base Bid Item: Drawing number C2.0: 6" crusher run gravel on compacted subgrade

E. Alternate No. 5 - Provide LED lights in lieu of fluorescent lights base bid as shown on Electrical drawings.
   1. Base Bid Item: Fluorescent lights as shown on Electrical Drawings.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 3000 ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preconstruction meeting.

B. Progress meetings.

C. Submittals for review, information, and project closeout.

D. Number of copies of submittals.

E. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. SCO NC DOA Form OC-15- General Conditions

B. Supplementary General Conditions

C. Section 01 3216 - Construction Progress Schedule: Form, content, and administration of schedules.

D. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.

E. Section 01 7800 - Closeout Submittals: Project record documents.

1.03 PROJECT COORDINATION

A. Project Coordinator: General Contractor.

B. Cooperate with the NC DOT's Representative in allocation of mobilization areas of site; for field offices and sheds, for vehicular access, traffic, and parking facilities.

C. During construction, coordinate use of site and facilities through the NC DOT's representative.

D. Comply with NC DOT's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.

E. Comply with instructions of the NC DOT for use of temporary utilities and construction facilities.

F. Make the following types of submittals to Architect through the Project Coordinator:

1. Requests for interpretation.
2. Requests for substitution.
3. Shop drawings, product data, and samples.
4. Test and inspection reports.
5. Manufacturer's instructions and field reports.
6. Applications for payment and change order requests.

7. Progress schedules.
8. Coordination drawings.
9. Correction Punch List and Final Correction Punch List for Final Acceptance.
10. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

A. NC DOT will schedule a meeting after Notice of Award.

B. Attendance Required:
   1. NC DOT (Owner).
   2. Architect.
   3. General Contractor.
   4. Major Subcontractors.
   5. State Construction Office Project Monitor.

C. Agenda:
   1. Distribution of Contract Documents.
   2. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
   3. Designation of personnel representing the parties to Contract and Architect.
   4. Designation of personnel and emergency personal representing the parties to Contract, State Construction Office and NC DOT.
   5. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
   6. Scheduling.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, NC DOT, participants, and those affected by decisions made.

3.02 PROGRESS MEETINGS

A. The architect will schedule and administer meetings throughout progress of the Work at maximum monthly intervals.

B. Project Coordinator will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required: Job superintendent, major Subcontractors and suppliers, NC DOT, Architect, and State Construction Office Monitor.

D. Agenda:

1. Review minutes of previous meetings.
2. Review of Work progress- one month look-ahead.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Maintenance of progress schedule.
7. Corrective measures to regain projected schedules.
8. Planned progress during succeeding work period.
9. Maintenance of quality and work standards.
10. Effect of proposed changes on progress schedule and coordination.
11. Other business relating to Work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, NC DOT, participants, and those affected by decisions made.

3.03 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:

1. Product data.
2. Shop drawings.
3. Samples for selection.
4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

C. Samples will be reviewed for color or finish selection to confirm selections and allow time to select alternate colors if products are discontinued or chosen from other specified manufacturers.

D. All submittals with colors specified or to be selected must be submitted at the same time.

E. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

3.04 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:

1. Design data.
2. Certificates.

3. Test reports.
4. Inspection reports.
5. Manufacturer's instructions.
6. Manufacturer's field reports.
7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for NC DOT. No action will be taken.

3.05 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Final Acceptance.

B. Submit Final Correction Punch List for Final Acceptance.

C. When the following are specified in individual sections, submit them at project closeout:
1. Project record documents.
2. Operation and maintenance data.
3. Warranties.
4. Bonds.
5. Other types as indicated.

D. Submit for NC DOT's benefit during and after project completion.

3.06 NUMBER OF COPIES OF SUBMITTALS

A. Documents for Review:
1. Small Size Sheets, Not Larger Than 8-1/2 x 11 inches: Submit the number of copies that Contractor requires, plus two copies that will be retained by Architect.

B. Documents for Information: Submit two copies.

C. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
1. After review, produce duplicates.
2. Retained samples will not be returned to Contractor unless specifically so stated.

3.07 SUBMITTAL PROCEDURES

A. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related Work.
2. Generic, non-project specific information submitted as shop drawings do not meet the requirements for shop drawings.

B. Transmit each submittal with a copy of approved submittal form.

C. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.

D. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.

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

F. Schedule submittals to expedite the Project, and coordinate submission of related items.

G. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.

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

I. Provide space for Contractor and Architect review stamps.

J. When revised for resubmission, identify all changes made since previous submission.

K. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

L. Submittals not requested will not be recognized or processed.

END OF SECTION

SECTION 01 3216 CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preliminary schedule.

B. Construction progress schedule, bar chart type.

1.02 RELATED SECTIONS

A. Section 01 1000 - Summary: Work sequence.

1.03 REFERENCE STANDARDS

A. AGC (CPSM) - Construction Planning and Scheduling Manual; 2004.

B. M-H (CPM) - CPM in Construction Management - Project Management with CPM; O'Brien; 2006.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

C. Provide legend for symbols and abbreviations used.

3.03 BAR CHARTS

A. Include a separate bar for each major portion of Work or operation.

B. Identify the first work day of each week.

3.04 REVIEW AND EVALUATION OF SCHEDULE

A. Project schedule will be reviewed at the monthly meeting.

B. Evaluate project status to determine work behind schedule and work ahead of schedule.

C. After review, revise as necessary as result of review, and resubmit within 10 days.

3.05 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Annotate diagrams to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Final Acceptance.

F. Submit reports required to support recommended changes.

3.06 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Architect, NC DOT, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

END OF SECTION

SECTION 01 4000 QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. References and standards.

B. Submittals.

C. References and standards.

D. Mock-ups.

E. Control of installation.

F. Testing and inspection agencies and services.

G. Control of installation.

H. Mock-ups.

I. Special Inspections.

J. Manufacturers' field services.

K. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

B. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2014).

B. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2014.

C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2013.

D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2012a.

E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing; 2014a.

F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2013.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Contractor to submit concrete mix design and any additional information requirede elsewhere in the specifications

C. See Plumbing, Mechanical and Electrical for required testing.

D. Testing Agency Qualifications:
   1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.

E. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.

f. Location in the Project.
g. Type of test/inspection.
h. Date of test/inspection.
i. Results of test/inspection.
j. Conformance with Contract Documents.
k. When requested by Architect, provide interpretation of results.

F. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

1.05 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Final Acceptance.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.06 TESTING AND INSPECTION AGENCIES

A. As indicated in individual specification sections, NC DOT will employ and pay for services of an independent testing agency to perform other specified testing.

B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

C. Employed Agency:
1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM C1021, ASTM C1077, ASTM C1093, and ASTM D3740.
2. Inspection agency: Comply with requirements of ASTM D3740, and ASTM E329.
3. Laboratory: Authorized to operate in North Carolina.
4. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
5. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 EXECUTION

2.01 CONTROL OF INSTALLATION

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

B. Comply with manufacturers' instructions, including each step in sequence.

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

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

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

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

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

2.02 MOCK-UPS

A. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.

B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Accepted mock-ups shall be a comparison standard for the remaining Work.

D. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

2.03 TESTING AND INSPECTION

A. Site inspections will be performed by State Construction office monitor, state electrical inspector, and designers of record.

B. There is no regulatory building inspections by Scotland County Officials.

C. Contractor responsibilities:
   1. Deliver to NC DOT testing facility at designated location adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Notify Architect and Engineers 48 hours prior to expected time for operations requiring testing/inspections services.

2.04 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to specified requirements.

END OF SECTION

SECTION 015213 FIELD OFFICES AND SHEDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary field offices for use of General Contractor.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: use of premises and responsibility for providing field offices.

PART 2 PRODUCTS

2.01 MATERIALS, EQUIPMENT, FURNISHINGS

A. Materials, Equipment, Furnishings: Serviceable, new or used, adequate for required purpose.

2.02 CONSTRUCTION

A. Portable or mobile buildings, securely fixed to foundations, with steps and landings at entrance doors.

B. Construction: Structurally sound, secure, weather tight enclosures for office. Maintain during progress of Work; remove when no longer needed- can make use of Owner's site utilities for connection.

C. Fire Extinguishers: Appropriate type fire extinguisher at each office.

2.03 CONTRACTOR OFFICE AND FACILITIES

A. Size: For General Contractor's needs- project meetings will be held at Owner's facility.

B. General Contractor to provide toilet.

PART 3 EXECUTION

3.01 PREPARATION

A. Fill and grade sites for temporary structures to provide drainage away from buildings.

3.02 INSTALLATION

A. Install office spaces ready for occupancy 15 days after date fixed in Notice to Proceed.

3.03 MAINTENANCE AND CLEANING

A. Maintain approach walks free of mud, water, and snow.

3.04 REMOVAL

A. At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

END OF SECTION

SECTION 015500 VEHICULAR ACCESS AND PARKING

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: access to site, work sequence, and occupancy.

B. Section 31 2200 - Grading: Specifications for earthwork and paving bases.

PART 2 PRODUCTS- NOT USED

PART 3 EXECUTION

3.01 ACCESS ROADS

A. Use of designated existing on-site streets and driveways for construction traffic is permitted.

B. Tracked vehicles not allowed on paved areas.

C. Provide and maintain access to fire hydrants free of obstructions.

3.02 PARKING

A. Use of designated areas of existing parking facilities by construction personnel is permitted.

3.03 PERMANENT PAVEMENTS AND PARKING FACILITIES

A. Prior to Substantial Completion the base for permanent roads and parking areas may be used for construction traffic.

3.04 MAINTENANCE

A. Maintain traffic and parking areas in a sound condition free of excavated material, construction equipment, Products, mud, snow, and ice.

B. Maintain existing paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

3.05 REMOVAL, REPAIR

A. Repair existing facilities damaged by use, to original condition.

B. Repair damage caused by installation.

3.06 MUD FROM SITE VEHICLES

A. Provide means of removing mud from vehicle wheels before entering streets.

END OF SECTION

SECTION 016000 PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Transportation, handling, storage and protection.

C. Product option requirements.

D. Substitution limitations and procedures.

E. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

D. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

PART 2 PRODUCTS

2.01 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.

B. DO NOT USE products having any of the following characteristics:

1. Made outside the United States, its territories, Canada, or Mexico.
2. Made using or containing CFC's or HCFC's.
3. Made of wood from newly cut old growth timber.

C. Where all other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 01 6116.
   2. If wet-applied, have lower VOC content, as defined in Section 01 6116.
   3. Have a published Green Screen Chemical Hazard Analysis.

D. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Size terminal lugs to NFPA 70, include lugs for terminal box.

E. Cord and Plug: Provide minimum 6 foot cord and plug including grounding connector for connection to electric wiring system. Cord of longer length is specified in individual specification sections.

F. Urea-Formaldehyde Prohibition:
   1. Overall Project Requirement: Provide composite wood and agri-fiber products having no added urea-formaldehyde resins.
   2. Require each installer to certify compliance and submit product data from 01 6000.01
      a. showing product content.
   3. Specific Product Categories: Comply with limitations specified elsewhere.

G. Adhesives:
   1. Definition: This provision applies to gunnable, trowelable, and liquid-applied adhesives, sealants, and sealant primers used anywhere on the interior of the building inside the weather barrier, including duct sealers.
   2. 2. Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.
   3. Require each installer to certify compliance and submit product data in form 01 6000.01 for each adhesive used showing product content.
   4. Specific Product Categories: Comply with limitations specified elsewhere.

H. Aerosol Adhesives:
   1. 1. Provide only products having lower volatile organic compound (VOC) content than required by GreenSeal GS-36.
   2. Require each installer to certify compliance and submit product data in form 01 6000.01 for each aerosol adhesive used showing product content.
   3. Specific Product Categories: Comply with limitations specified elsewhere.

I. Joint Sealants, Including Duct Sealers:
   1. Provide only products having lower volatile organic compound (VOC) content than required by Bay Area Air Quality Management District Regulation 8, Rule No.51.
   2. Require each installer to certify compliance and submit product data in form 01 6000.01 for
      a. each sealant used showing product content.

3. Specific Product Categories: Comply with limitations specified elsewhere.

J. Recycled Content:

1. Contractor to provide materials, wherever possible, with post-consumer or post-industrial recycled content.
2. Contractor to provide materials, wherever possible, that have been extracted, harvested, or
    a. recovered, as well as manufactured, within a radius of 500 miles from the project site.

2.02 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

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

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

2.03 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION PROCEDURES

A. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

B. A request for substitution constitutes a representation that the submitter:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
2. Agrees to provide the same warranty for the substitution as for the specified product.
3. Agrees to coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to NC DOT.
4. Waives claims for additional costs or time extension that may subsequently become apparent.

3.02 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.03 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

G. Comply with manufacturer's warranty conditions, if any.

H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

I. Prevent contact with material that may cause corrosion, discoloration, or staining.

J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 017000 EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Cutting and patching.

C. Surveying for laying out the work.

D. Cleaning and protection.

E. Starting of systems and equipment.

F. Demonstration and instruction of NC DOT personnel.

G. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. Section 01 3000 - Administrative Requirements: Submittals procedures.

C. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties and bonds.

D. Section 07 8400 - Firestopping.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.

1. On request, submit documentation verifying accuracy of survey work.
2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.
3. Submit surveys and survey logs for the project record.

C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:

1. Structural integrity of any element of Project.
2. Integrity of weather exposed or moisture resistant element.
3. Efficiency, maintenance, or safety of any operational element.
4. Visual qualities of sight exposed elements.
5. Work of NC DOT or separate Contractor.

1.04 QUALIFICATIONS

A. For survey work, employ a land surveyor registered in North Carolina

B. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in North Carolina.

1.05 PROJECT CONDITIONS

A. Grade site as shown on Contract documents. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

1.06 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After NC DOT occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of NC DOT's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

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

B. Seal cracks or openings of substrate prior to applying next material or substance.

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

3.03 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

F. Utilize recognized engineering survey practices.

G. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.

H. Periodically verify layouts by same means.

I. Maintain a complete and accurate log of control and survey work as it progresses.

3.04 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.05 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. Perform whatever cutting and patching is necessary to:
   1. Complete the work.

2. Fit products together to integrate with other work.
3. Provide openings for penetration of mechanical, electrical, and other services.
4. Match work that has been cut to adjacent work.
5. Repair areas adjacent to cuts to required condition.
6. Repair new work damaged by subsequent work.
7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-conforming work.

C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

F. Restore work with new products in accordance with requirements of Contract Documents.

G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

H. Patching:
1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
2. Match color, texture, and appearance.
3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.06 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.07 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

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

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

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

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

G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.08 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Architect and owner seven days prior to start-up of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.09 DEMONSTRATION AND INSTRUCTION

A. Demonstrate operation and maintenance of products to NC DOT's personnel two weeks prior to date of Substantial Completion.

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

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

D. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of owner personnel.

E. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with NC DOT's personnel in detail to explain all aspects of operation and maintenance.

F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

3.10 ADJUSTING

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

3.11 FINAL CLEANING

A. Use cleaning materials that are nonhazardous.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

E. Clean filters of operating equipment.

F. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.

G. Clean site; sweep paved areas, rake clean landscaped surfaces.

H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.12 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.

B. Accompany Architect on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

C. Notify Architect when work is considered ready for Architect's Final Acceptance inspection.

D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Final Acceptance inspection.

E. Conduct Final Acceptance inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to NC DOT-occupied areas.

G. Notify Architect when work is considered finally complete and ready for Architect's Final Acceptance final inspection.

H. Complete items of work determined by Architect listed in executed Certificate of Final Acceptance.

END OF SECTION

SECTION 017419 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. NC DOT requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. NC DOT may decide to pay for additional recycling, salvage, and/or reuse based on Landfill Alternatives Proposal specified below.

E. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
   1. Aluminum and plastic beverage containers.
   2. Corrugated cardboard.
   3. Wood pallets.
   4. Clean dimensional wood.
   5. Land clearing debris, including brush, branches, logs, and stumps; see Section 31 1000 - Site Clearing for use options.
   6. Concrete.
   7. Bricks.
   8. Concrete masonry units.
   9. Asphalt paving.
   10. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
   11. Glass.
   12. Plastic buckets.
   13. Carpet, carpet cushion, carpet tile, and carpet remnants, both new and removed: DuPont (http://flooring.dupont.com) and Interface (www.interfaceinc.com) conduct reclamation programs.
   14. Asphalt roofing shingles.
   15. Windows, doors, and door hardware.
   16. Plumbing fixtures.
   17. Mechanical and electrical equipment.
   18. Fluorescent lamps (light bulbs).
   19. Acoustical ceiling tile and panels.

F. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, incineration, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.

G. The following sources may be useful in developing the Waste Management Plan:
   1. NCDOT Waste Management Analyst; John Sharp, 919-733-6837, ext. 218, e-mail: jsharp@ncdot.gov

2. Scotland County Department of Recycling/ Public Works; Solid Waste Enforcement Officer J.R. Horne, 910-610-5262 or jhorne@scotlandcounty.org.
3. Recycling Haulers and Markets: The attached list contains local haulers and markets for recyclable materials. This list is provided for information only and is not necessarily comprehensive; other haulers and markets are acceptable.
4. Construction & Demolition Waste Disposal:
   a. Wagram Landfill; <http://www.scotlandcounty.org/recycling-locations.aspx>

H. Methods of trash/waste disposal that are not acceptable are:
1. Burning on the project site.
2. Burying on the project site.
3. Dumping or burying on other property, public or private.
4. Other illegal dumping or burying.

I. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. Section 01 6000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

C. Section 01 7000 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

D. Section 31 1000 - Site Clearing: Handling and disposal of land clearing debris.

1.03 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Landfill Alternatives Proposal: Within 10 calendar days after receipt of Notice of Award of Bid, or prior to any trash or waste removal, whichever occurs sooner, submit a projection of trash/waste that will require disposal and alternatives to landfilling, with net costs.
   1. Submit to Architect for NC DOT's review and approval.
   2. If NC DOT wishes to implement any cost alternatives, the Contract Price will be adjusted as specified elsewhere.
   3. Include an analysis of trash/waste to be generated and landfill options as specified for Waste Management Plan described below.
   4. Describe as many alternatives to landfilling as possible:
      a. List each material proposed to be salvaged, reused, or recycled.
      b. List the proposed local market for each material.
      c. State the estimated net cost resulting from each alternative, after subtracting revenue from sale of recycled or salvaged materials and landfill tipping fees saved due to diversion of materials from the landfill.

C. Once NC DOT has determined which of the landfill alternatives addressed in the Proposal above are acceptable, prepare and submit Waste Management Plan; submit within 10 calendar days after notification by Architect. Submit plan in format provided by the attached form 017419A.

D. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
   1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
   2. Submit Report in format provided by the attached form 017419B.
   3. Landfill Disposal: Include the following information:
      a. Identification of material.
      b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
      c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   4. Incinerator Disposal: Include the following information:
      a. Identification of material.

b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.
c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.

5. Recycled and Salvaged Materials: Include the following information for each:
   a. Identification of material, including those retrieved by installer for use on other projects.
   b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
   c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
   d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
6. Material Reused on Project: Include the following information for each:
   a. Identification of material and how it was used in the project.
   b. Amount, in tons or cubic yards.
   c. Include weight tickets as evidence of quantity.
7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

E. Recycling Incentive Programs:
   1. Where revenue accrues to Contractor, submit copies of documentation required to qualify for incentive.
   2. Where revenue accrues to NC DOT, submit any additional documentation required by NC DOT in addition to information provided in periodic Waste Disposal Report.

PART 2 PRODUCTS

2.01 PRODUCT SUBSTITUTIONS

A. See Section 01 6000 - Product Requirements for substitution submission procedures.

B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 6000:
   1. Relative amount of waste produced, compared to specified product.
   2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Price.
   3. Proposed disposal method for waste product.
   4. Markets for recycled waste product.

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

A. See Section 01 3000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. See Section 01 6000 for waste prevention requirements related to delivery, storage, and handling.

C. See Section 01 7000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, NC DOT, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Pre-bid meeting.
   2. Pre-construction meeting.
   3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. Provide containers as required.
   2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
   3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 017800 CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project Record Documents.

B. Operation and Maintenance Data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.

B. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

C. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.

D. Individual Product Sections: Specific requirements for operation and maintenance data.

E. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents ("As-Built" mark-up set): Submit documents to Architect with claim for final Application for Payment.

B. Operation and Maintenance Data:
   1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
   2. For equipment, or component parts of equipment put into service during construction and operated by NC DOT, submit completed documents within ten days after acceptance.
   3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   4. Submit two sets of revised final documents in final form within 10 days after final inspection.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with NC DOT's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Final Acceptance, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Final Acceptance, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings, Project Manual.

2. Addenda, Bulletin Drawings
3. Change Orders and other modifications to the Contract.
4. Reviewed shop drawings, product data, and samples.

B. Ensure entries are complete and accurate, enabling future reference by NC DOT.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
1. Field changes of dimension and detail.
2. Details not on original Contract drawings.
3. All subcontractors are to mark on the same record set.

3.02 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
1. Product data, with catalog number, size, composition, and color and texture designations.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
1. Description of unit or system, and component parts.
2. Identify function, normal operating characteristics, and limiting conditions.
3. Include performance curves, with engineering data and tests.
4. Complete nomenclature and model number of replaceable parts.

B. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

C. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

D. Provide servicing and lubrication schedule, and list of lubricants required.

E. Include manufacturer's printed operation and maintenance instructions.

F. Include sequence of operation by controls manufacturer.

G. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

H. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for NC DOT's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

J. Arrangement of Contents: Organize each volume in parts as follows:
   1. Project Directory.
   2. Table of Contents, of all volumes, and of this volume.
   3. Operation and Maintenance Data: Arranged by system, then by product category.
      a. Source data.
      b. Operation and maintenance data.
      c. Field quality control data.
      d. Photocopies of warranties and bonds.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with NC DOT's permission, leave date of beginning of time of warranty until the Date of Final Acceptance is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Include originals of each in operation and maintenance manuals, indexed separately on Table of Contents.

END OF SECTION

SECTION 030000 SITE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the Contract Documents apply to the work of this Section.

1.2 DESCRIPTION OF WORK:

A. Extent of Portland cement concrete paving is shown on drawings, including:

1. Walkways
2. Service area pavement.

1.3 SUBMITTALS

A. Provide certification that all materials meet the North Carolina Department of Transportation (NCDOT) Standard Specifications for Roads and Structures for the class of concrete required.

1.4 JOB CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. 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.

1. Use flexible spring steel forms or laminated boards to form radius bends as required.
2. Coat forms with a nonstaining form release agent that will not discolor or deface surface of concrete.

B. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A 185.

C. Reinforcing Steel: ASTM A 615, Grade 60, deformed.

D. Concrete Materials: Comply with requirements of applicable Division 3 sections for concrete materials, admixtures, bonding materials, curing materials, and others as required.

E. Expansion Joint Materials: Comply with requirements of applicable Division 7 sections for performed expansion joint fillers and sealers.

F. Antispalling Compound: Combination of boiled linseed oil and mineral spirits, complying with AASHTO M-233.

G. Liquid-Membrane Forming and Sealing Curing Compound: Comply with NCDOT Standard Specifications for Road and Structures.

2.2 CONCRETE MIX, DESIGN, AND TESTING

A. Comply with requirements of applicable Division 3 sections for concrete mix design, sampling and testing, and quality control or NCDOT Standard Specifications for Roads and Structures whichever is more stringent.

B. Design mix to produce normal-weight concrete consisting of Portland cement, aggregate, water-reducing or high-range water-reducing admixture (superplasticizer), air-entraining admixture, and water to produce the following properties:

1. Comply with the requirements of NCDOT 3000 psi concrete, unless otherwise indicated.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

B. 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,

3.2 FORM CONSTRUCTION

A. Set forms to required grades and lines, braced and secured. Install forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.

B. Check completed formwork for grade and alignment to following tolerances:

1. Top of forms not more than 1/8 inch in 10 feet.

2. Vertical face on longitudinal axis, not more than 1/4 inches in 10 feet.

C. Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.

3.3 REINFORCEMENT

A. Locate, place and support reinforcement as specified in Division 3 sections, unless otherwise indicated.

3.4 CONCRETE PLACEMENT

A. General: Comply with requirements of applicable Division 3 sections for mixing and placing concrete or NCDOT Standard Specifications for Roads and Structures or whichever is more stringent..

B. Do not place concrete until subbase and forms have been checked for line and grade. 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.

C. Place concrete by methods that prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.

D. Deposit and spread concrete in a continuous operation between transverse joints as far as possible. If interrupted for more than 1/2 hour, place a construction joint.

E. Fabricated Bar Mats: Keep mats clean and free from excessive rust, and handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities or replace units as required before placement. Set mats for a minimum 2-inch overlap to adjacent mats.

F. Place concrete in 2 operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.

G. Remove and replace portions of bottom layer of concrete that have been placed more than 15 minutes without being covered by top layer or use bonding agent if acceptable to Architect.

H. Curbs and Gutters: Automatic machine may be used for curb and gutter placement. If machine placement is to be used, submit revised mix design and laboratory test results that meet or exceed minimums indicated. Machine placement must produce curbs and gutters to required cross-section,

lines, grades, finish, and jointing as indicated for formed concrete. If results are not acceptable, remove and replace with formed concrete meeting requirements.

3.5 JOINTS

A. 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.

B. Weakened-Plane (Contraction) Joints: Provide weakened-plane (contraction) joints, sectioning concrete into areas as shown on drawings. Construct weakened-plane joints for a depth equal to at least 1/4 concrete thickness, as follows:

1. Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.

2. Sawed Joints: Form weakened-plane joints with powered saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut joints into hardened concrete as soon as surface will not be torn, abraded, or otherwise damaged by cutting action.

3. Inserts: Use embedded strips of metal or sealed wood to form weakened-plane joints. Set strips into plastic concrete and carefully remove strips after concrete has hardened.

C. Construction Joints: Place construction joints at end of placements and at locations where placement operations are stopped for more than 1/2 hour, except where such placements terminate at expansion joints.

1. Construct joints as indicated or, if not indicated, use standard metal keyway-section forms.

D. 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.

E. Locate expansion joints at 50 feet o.c. for each pavement lane unless otherwise indicated.

F. Extend joint fillers full width and depth of joint, not less than 1/2 inch or more than 1 inch below finished surface where joint sealer is indicated. If no joint sealer, place top of joint filler flush with finished concrete surface.

G. Provide joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required, lace or clip joint filler sections together.

H. Protect top edge of joint filler during concrete placement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint.

I. Fillers and Sealants: Comply with requirements of applicable Division 7 sections for preparation of joints, materials, installation, and performance.

J. Refer to Drawings for scoring patterns for:

1. Selected sidewalk areas

2. Service Areas

3.6 CONCRETE FINISHING

A. After striking-off and consolidating concrete, smooth surface by screening and floating. Use hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.

B. After floating, test surface for trueness with a 10-ft. straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous smooth finish.

C. Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round to 1/2-inch radius, unless otherwise indicated. Eliminate tool marks on concrete surface.

D. After completion of floating and when excess moisture or surface sheen has disappeared, complete troweling and finish surface as follows:

1. Broom finish by drawing a fine-hair broom across concrete surface perpendicular to line of traffic. Repeat operation if required to provide a fine line texture acceptable to Architect.

2. Exposed-Aggregate Finish: At handicap ramps and where indicated on drawings, by applying an approved retardant curing compound to the surface. Allow minimum 12 hours of setting time before washing surface to expose a maximum of (1/3) one-third of stone surface. Aggregate shall be brown Riverstone having a uniform size and color for each subsequent concrete pour. Aggregate size shall range between 1/2” and 3/4”.

E. 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.

3.7 CURING

A. Protect and cure finished concrete paving in compliance with applicable requirements of Division 3 sections. Use membrane-forming curing and sealing compound or approved moist-curing methods.

3.8 REPAIRS AND PROTECTIONS

A. Repair or replace cracked, broken or defective concrete curbs and curb and gutter, as directed by Architect.

B. Replace cracked, broken or defective concrete sidewalks.

C. Repair or replace cracked, broken or defective concrete pavement, as directed by Architect.

D. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to pavement with epoxy adhesive.

E. 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.

F. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just before final inspection.

END OF SECTION

SECTION 031000 CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.

B. Openings for other work.

1.02 REFERENCE STANDARDS

A. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).

B. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2011.

PART 2 PRODUCTS

2.01 FORMWORK - GENERAL

A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.

B. Design and construct to provide resultant concrete that conforms to design with respect to shape, lines, and dimensions.

C. Comply with applicable State codes with respect to design, fabrication, erection, and removal of formwork.

2.02 WOOD FORM MATERIALS

A. Form Materials: At the discretion of the Contractor.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

3.03 INSERTS, EMBEDDED PARTS, AND OPENINGS

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

B. Locate and set in place items that will be cast directly into concrete.

C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.

3.04 FIELD QUALITY CONTROL

A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.

3.05 FORM REMOVAL

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

END OF SECTION

SECTION 03 2000

CONCRETE REINFORCING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.

B. Supports and accessories for steel reinforcement.

1.02 RELATED REQUIREMENTS

A. Section 03 1000 - Concrete Forming and Accessories.

B. Section 03 3000 - Cast-in-Place Concrete.

C. Section 04 2000 - Unit Masonry: Reinforcement for masonry.

1.03 REFERENCE STANDARDS

A. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).

B. ACI SP-66 - ACI Detailing Manual; 2004.

C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.

D. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.

E. CRSI (DA4) - Manual of Standard Practice; 2009.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.

C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301.

PART 2 PRODUCTS

2.01 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).

1. Plain billet-steel bars.

2. Unfinished.

B. Steel Welded Wire Reinforcement (WWR): Galvanized, deformed type; ASTM A1064/A1064M.

1. Form: Flat Sheets.

2. WWR Style: As indicated on drawings.

C. Reinforcement Accessories:

1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch.

2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

3. Provide stainless steel components for placement within 1-1/2 inches of weathering surfaces.

2.02 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.

B. Locate reinforcing splices not indicated on drawings at point of minimum stress.

PART 3 EXECUTION

3.01 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position.

B. Do not displace or damage vapor barrier.

C. Conform to applicable code for concrete cover over reinforcement.

3.02 SCHEDULES

A. Reinforcement For Foundation Wall Framing Members and Slab-on-Grade: Deformed bars and welded wire reinforcement, unfinished.

END OF SECTION

SECTION 03 3000

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Floors and slabs on grade.

B. Concrete foundations and anchor bolts for pre-engineered building.

C. Concrete reinforcement.

D. Joint devices associated with concrete work.

E. Miscellaneous concrete elements, including equipment pads.

F. Concrete curing.

G. Vapor Retarder at concrete slab on grade.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Products and installation for sealants for saw cut joints and isolation joints in slabs.

1.03 REFERENCE STANDARDS

A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).

B. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).

C. ACI 302.1R - Guide for Concrete Floor and Slab Construction; 2004 (Errata 2007).

D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000.

E. ACI 305R - Hot Weather Concreting; 2010.

F. ACI 306R - Cold Weather Concreting; 2010.

G. ACI 308R - Guide to Curing Concrete; 2001 (Reapproved 2008).

H. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2011.

I. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016.

J. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2015a.

K. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.

L. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2013.

M. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2012.

N. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.

O. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2014.

P. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.

Q. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.

R. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2013.

S. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.

T. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014.

U. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2013).

V. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2011.

W. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2011.

X. COE CRD-C 513 - COE Specifications for Rubber Waterstops; 1974.

Y. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).

Z. NSF 372 - Drinking Water System Components - Lead Content; 2011.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.

C. Mix Design: Submit proposed concrete mix design for each class of concrete for review prior to concrete operations.

D. Samples: Submit samples of underslab vapor retarder to be used.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.

B. Follow recommendations of ACI 305R when concreting during hot weather.

C. Follow recommendations of ACI 306R when concreting during cold weather.

PART 2 PRODUCTS

2.01 FORMWORK

A. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.

2.02 REINFORCEMENT

A. Comply with requirements of Section 03 2000.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type.

B. Fine and Coarse Aggregates: ASTM C 33.

C. Fly Ash: ASTM C618, Class C or F.

D. Water: Clean and not detrimental to concrete.

2.04 ADMIXTURES

A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

B. Air Entrainment Admixture: ASTM C260/C260M.

2.05 ACCESSORY MATERIALS

A. Underslab Vapor Retarder: Multi-layer, fabric-, cord-, grid-, or aluminum-reinforced polyethylene or equivalent, complying with ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use of single ply polyethylene is prohibited.

1. Installation: Comply with ASTM E1643.

2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations in vapor retarder.

B. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.

1. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch.

2.06 BONDING AND JOINTING PRODUCTS

A. Waterstops: Bentonite and butyl rubber, complying with NSF 61 and NSF 372.

1. Configuration: As indicated on drawings.

2. Size: As indicated on drawings.

B. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.

C. Joint Filler: Nonextruding, resilient asphalt impregnated fiberboard or felt, complying with ASTM D 1751, 1/4 inch thick and 4 inches deep; tongue and groove profile.

D. Sealant and Primer: As specified in Section 07 9005.

2.07 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.

1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

D. Normal Weight Concrete:

1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 3,000 pounds per square inch.

2. Fly Ash Content: Maximum 25 percent of cementitious materials by weight.

3. Water-Cement Ratio: Determined by mix design.

4. Total Air Content: Determined by mix design in accordance with ASTM C173/C173M.

5. Maximum Slump: 4 inches.

2.08 MIXING

A. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.

B. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

3.04 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Place concrete for floor slabs in accordance with ACI 302.1R.

C. Notify Architect not less than 24 hours prior to commencement of placement operations.

D. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

E. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.05 SLAB JOINTING

A. Locate joints as indicated on the drawings.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.

3.06 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:

1. Exposed to View and Foot Traffic: F(F) of 20; F(L) of 15, on-grade only.

2. Under Thick-Bed Tile: F(F) of 20; F(L) of 15, on-grade only.

3. Under Carpeting: F(F) of 25; F(L) of 20, on-grade only.

4. Under Thin Resilient Flooring and Thinset Tile: F(F) of 35; F(L) of 25, on-grade only.

B. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13/F(L) 10.

C. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.07 CONCRETE FINISHING

A. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:

1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.

2. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.

3.08 CURING AND PROTECTION

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Surfaces Not in Contact with Forms:

1. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.

2. Final Curing: Begin after initial curing but before surface is dry.

a. Curing Compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

3.09 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

D. Compressive Strength Tests: ASTM C39/C39M. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.

E. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

F. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.10 DEFECTIVE CONCRETE

A. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

3.11 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

3.12 WASTE MANAGEMENT

A. Comply with Section 01 1510 - Construction & Demolition Materials Recycling Requirements, and Section 06 1000 - Rough Carpentry.

B. Separate, reuse and recycle waste materials to maximum extent economically feasible. Form lumber may be reused on the job for blocking, etc.

C. Before concrete pours, designate locations or uses for excess concrete. Options include:

1. Additional site paving,

2. Post footing anchorage,

3. Riprap reinforcing,

4. Flowable fill,

5. Footing bottom, retaining wall footing ballast,

6. Storm structure covers,

7. Underground utility pipe kickers,

8. Storm pipe flared end section,

9. Toe wash protection and shoulder and toe outfall restraints for temporary erosion pipes.

D. Before concrete pours, designate a location for cleaning out concrete trucks. Options include:

1. On-site area to be paved later in Project.

E. Collect reinforcing steel and place in designated area for recycling.

END OF SECTION

SECTION 04 0511

MORTAR AND MASONRY GROUT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Mortar for masonry.

B. Grout for masonry.

1.02 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry: Installation of mortar and grout.

1.03 REFERENCE STANDARDS

A. ACI 530/530.1/ERTA - Building Code Requirements and Specification for Masonry Structures and Related Commentaries; 2011.

B. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.

C. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2011.

D. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.

E. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).

F. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.

G. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2011.

H. ASTM C476 - Standard Specification for Grout for Masonry; 2010.

I. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2012.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Include design mix and indicate whether the Proportion or Property specification of ASTM C270 is to be used.

C. Reports: Submit reports on mortar indicating conformance of mortar to property requirements of ASTM C270 and test and evaluation reports per ASTM C780.

1.05 QUALITY ASSURANCE

A. Comply with provisions of ACI 530/530.1/ERTA, except where exceeded by requirements of the contract documents.

1.06 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of ACI 530/530.1/ERTA or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 MORTAR AND GROUT APPLICATIONS

A. Field-mix all mortar and grout.

B. Mortar Mix Designs: ASTM C270, Property Specification.

2.02 MATERIALS

A. Portland Cement: ASTM C150/C150M.

1. Type: Type I - Normal; ASTM C150/C150M.

2. Color: Standard gray.

B. Hydrated Lime: ASTM C207, Type S.

C. Mortar Aggregate: ASTM C144.

D. Grout Aggregate: ASTM C404.

E. Water: Clean and potable.

2.03 MORTAR MIXING

A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C270 and in quantities needed for immediate use.

B. Maintain sand uniformly damp immediately before the mixing process.

C. Do not use anti-freeze compounds to lower the freezing point of mortar.

D. If water is lost by evaporation, re-temper only within two hours of mixing.

2.04 GROUT MIXING

A. Mix grout in accordance with ASTM C94/C94M.

B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 for fine and coarse grout.

C. Add admixtures in accordance with manufacturer's instructions; mix uniformly.

D. Do not use anti-freeze compounds to lower the freezing point of grout.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install mortar and grout to requirements of section(s) in which masonry is specified and at locations as indicated in drawings.

3.02 GROUTING

A. Perform all grouting by means of low-lift technique. Do not employ high-lift grouting.

B. Low-Lift Grouting:

1. Limit height of pours to 60 inches.

2. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.

3. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.

END OF SECTION

SECTION 04 2000

UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete block.

B. Mortar and Grout.

C. Reinforcement and Anchorage.

D. Flashings.

E. Lintels.

F. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 2000 - Concrete Reinforcing: Reinforcing steel for grouted masonry.

B. Section 04 0511 - Mortar and Masonry Grout.

C. Section [07 9005]: Joint Sealants: Sealing control and expansion joints, interior sealants.

D. Section 09 9000: Painting and Coatings..

1.03 REFERENCE STANDARDS

A. ACI 530/530.1/ERTA - Building Code Requirements and Specification for Masonry Structures and Related Commentaries; 2011.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

C. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2009a (Reapproved 2014).

D. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.

E. ASTM C55 - Standard Specification for Concrete Building Brick; 2011.

F. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2014.

G. ASTM C91/C91M - Standard Specification for Masonry Cement; 2012.

H. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2011.

I. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).

J. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2014.

K. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2011.

L. ASTM C476 - Standard Specification for Grout for Masonry; 2010.

M. ASTM C744 - Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units; 2014.

N. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2005.

O. BIA Technical Notes No. 28B - Brick Veneer/Steel Stud Walls; 2005.

P. BIA Technical Notes No. 46 - Maintenance of Brick Masonry; 2005.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

C. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

D. Provide shop drawings in accordance with ACI 315, showing bar size, placement, and bend schedules.

1.05 QUALITY ASSURANCE

A. Comply with provisions of ACI 530/530.1/ERTA, except where exceeded by requirements of the contract documents.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:

1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depth of 8 inches.

2. Special Shapes: Provide non-standard blocks configured for corners, lintels, and other detailed conditions.

3. Load-Bearing Units: ASTM C90, lightweight.

a. Hollow block, as indicated.

b. Exposed Faces: Special color and texture where indicated, as follows: Standard and Split Face, as shown on Drawings, Paint Grade.

4. Non-Loadbearing Units: ASTM C129.

a. Hollow block, as indicated.

b. Lightweight.

2.02 MORTAR AND GROUT MATERIALS

A. Mortar and Grout: As specified in Section 04 0511.

B. Hydrated Lime: ASTM C207, Type S.

C. Grout Aggregate: ASTM C404.

2.03 REINFORCEMENT AND ANCHORAGE

A. Manufacturers:

1. Blok-Lok Limited: www.blok-lok.com.

2. Hohmann & Barnard, Inc; 2-Seal Tie: www.h-b.com/sle.

3. WIRE-BOND: www.wirebond.com.

B. Reinforcing Steel: Type specified in Section 03 2000; size as indicated on drawings; uncoated finish.

C. Single Wythe Joint Reinforcement: Truss or ladder type; ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M, Class 3; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.

D. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from masonry face.

E. Wall Ties: Corrugated formed sheet metal, 7/8 inch wide by 0.06 inch thick, hot dip galvanized to ASTM A 153/A 153M, Class B, sized to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from masonry face.

F. Two-Piece Wall Ties: Formed steel wire, 0.1875 inch thick, adjustable, eye and pintle type, hot dip galvanized to ASTM A 153/A 153M, Class B, sized to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from masonry face and to allow vertical adjustment of up to 1-1/4 in.

2.04 FLASHINGS

A. Copper/Kraft Paper Flashings: 3 oz/sq ft sheet copper bonded to fiber reinforced asphalt treated Kraft paper.

2.05 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.

B. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.06 LINTELS

A. See structural drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of ACI 530/530.1/ERTA or applicable building code, whichever is more stringent.

3.04 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:

3.05 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

C. Remove excess mortar and mortar smears as work progresses.

D. Interlock intersections and external corners, except for units laid in stack bond.

E. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

3.06 REINFORCEMENT AND ANCHORAGE - GENERAL

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches horizontally and 24 inches vertically.

3.07 REINFORCEMENT AND ANCHORAGE - SINGLE WYTHE MASONRY

A. Install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.

3.08 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.

1. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up at least 8 inches, minimum, to form watertight pan at non-masonry construction.

2. Remove or cover protrusions or sharp edges that could puncture flashings.

3. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Extend metal flashings through exterior face of masonry and turn down to form drip. Install joint sealer below drip edge to prevent moisture migration under flashing.

C. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

3.09 LINTELS- SEE STRUCTURAL DRAWINGS

3.10 GROUTED COMPONENTS

A. Reinforce bond beams with 2, No. 4 bars, 1 inch from bottom web.

B. Lap splices minimum 24 bar diameters.

C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

D. Place and consolidate grout fill without displacing reinforcing.

E. At bearing locations, fill masonry cores with grout for a minimum 12 inches either side of opening.

3.11 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

C. Size control joints as indicated on drawings; if not shown, 3/4 inch wide and deep.

3.12 BUILT-IN WORK

A. As work progresses, install built-in metal door frames and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.

D. Do not build into masonry construction organic materials that are subject to deterioration.

3.13 TOLERANCES

A. Maximum Variation from Alignment of Columns: 1/4 inch.

B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.

G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.14 CUTTING AND FITTING

A. Cut and fit for chases. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.15 FIELD QUALITY CONTROL

A. NC DOT will perform field quality control tests, as specified in Section 01 4000.

3.16 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

3.17 PROTECTION

3.18 WASTE MANAGEMENT

A. Separate and recycle waste materials to the maximum extent economically feasible.

B. Fold up metal banding, flatten, and place in designated area for recycling.

C. Collect wood packing shims and pallets and place in designated area.

D. Place unused mixed mortar in designated locations where lower strength mortar meets the requirements for bulk fill, for example, use as retaining wall footing ballast, cavity fill at grade, or underground utility pipe kickers.

E. Separate masonry waste and place in designated area for use as structural fill or landscape uses.

END OF SECTION

SECTION 05 1200

STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural steel framing members, support members and struts.

B. Base plates, shear stud connectors.

C. Grouting under base plates.

1.02 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications: Steel fabrications affecting structural steel work.

1.03 REFERENCE STANDARDS

A. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges; 2010.

B. ASTM A1 - Standard Specification for Carbon Steel Tee Rails; 2000 (Reapproved 2010).

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

D. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished; 2013.

E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

F. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014.

G. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2014.

H. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric); 2014.

I. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

J. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.

K. ASTM A514/A514M - Standard Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding; 2014.

L. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts; 2007a (Reapproved 2014).

M. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts [Metric]; 2007.

N. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2011 (Reapproved 2015).

O. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014.

P. ASTM F436 - Standard Specification for Hardened Steel Washers; 2011.

Q. ASTM F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners; 2013.

R. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2007a.

S. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:

1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.

2. Connections not detailed.

3. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel Angles and Plates: ASTM A36/A36M.

B. Steel W Shapes and Tees: ASTM A992/A992M.

C. Crane Rails: ASTM A1, end hardened, ultrasonic tested, and _____; cross section and length as indicated on drawings.

D. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade B.

E. Shear Stud Connectors: Made from ASTM A 108 Grade 1015 bars.

F. Structural Bolts and Nuts: Carbon steel, ASTM A307, Grade A and galvanized in compliance with ASTM A153/A153M, Class C.

G. High-Strength Structural Bolts, Nuts, and Washers: ASTM A325 or ASTM A325M, Type 1, medium carbon, galvanized, with matching compatible ASTM A563 or ASTM A563M nuts and ASTM F436 washers.

H. Unheaded Anchor Rods: ASTM F1554, Grade 36, plain, with matching ASTM A563 or ASTM A563M nuts and ASTM F436 Type 1 washers.

I. Grout: Non-shrink, non-metallic aggregate type, complying with 1 and capable of developing a minimum compressive strength of 7,000 psi at 28 days.

2.02 FABRICATION

A. Shop fabricate to greatest extent possible.

2.03 FINISH

A. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.

2.04 SOURCE QUALITY CONTROL

A. Provide shop testing and analysis of structural steel.

B. Welded Connections: Visually inspect all shop-welded connections.

PART 3 EXECUTION

3.01 ERECTION

A. Erect structural steel in compliance with AISC S303 "Code of Standard Practice for Steel Buildings and Bridges".

B. Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.

C. Field weld components and shear studs indicated on shop drawings.

D. Do not field cut or alter structural members without approval of Architect.

E. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

F. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.02 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

3.03 WASTE MANAGEMENT

A. Collect cut-offs and scrap and place in designated areas for recycling per Section 01 7419.

END OF SECTION

SECTION 05 4000

COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formed steel stud interior wall framing.

B. Formed steel joist and purlin framing and bridging.

1.02 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

C. ASTM C955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases; 2011c.

D. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2011a.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with work of other sections that is to be installed in or adjacent to the metal framing system, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, and with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience and approved by manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Framing:

1. CEMCO: www.cemcosteel.com.

2. Clarkwestern Dietrich Building Systems LLC: www.clarkdietrich.com.

3. Marino: www.marinoware.com.

4. The Steel Network, Inc: www.SteelNetwork.com.

5. Substitutions: See Section 01 6000 - Product Requirements.

B. Framing Connectors and Accessories:

1. Same manufacturer as metal framing.

2. Simpson Strong Tie; ____: www.strongtie.com.

3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FRAMING SYSTEM

A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

2.03 FRAMING MATERIALS

A. Studs and Track: ASTM C955; studs formed to channel, "C", or "Sigma" shape with punched web; U-shaped track in matching nominal width and compatible height.

B. Joists and Purlins: Fabricated from ASTM A653/A653M steel sheet, with G90/Z275 hot dipped galvanized coating.

1. Base Metal: Structural Steel (SS), Grade 33/230.

2.04 FASTENERS

A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A153/A153M.

B. Anchorage Devices: Powder actuated.

PART 3 EXECUTION

3.01 INSTALLATION OF STUDS

A. Install components in accordance with manufacturers' instructions and ASTM C1007 requirements.

3.02 INSTALLATION OF JOISTS AND PURLINS

A. Install framing components in accordance with manufacturer's instructions.

B. Make provisions for erection stresses. Provide temporary alignment and bracing.

END OF SECTION

SECTION 05 5000

METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel items.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

B. Section 04 2000 - Unit Masonry: Placement of metal fabrications in masonry.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

D. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.

E. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2014.

F. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric); 2014.

G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

H. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.

I. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

J. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc; 2011.

K. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.

C. Plates: ASTM A283/A283M.

D. Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, plain.

E. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Obtain approval prior to site cutting or making adjustments not scheduled.

END OF SECTION

SECTION 06 1000

ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural dimension lumber framing.

B. Sheathing.

C. Roofing nailers.

D. Miscellaneous framing and sheathing.

E. Communications and electrical room mounting boards.

1.02 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

C. PS 1 - Structural Plywood; 2009.

D. PS 20 - American Softwood Lumber Standard; 2010.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.

1. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.

2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.02 CONSTRUCTION PANELS

A. Roof Sheathing: Oriented strand board wood structural panel; PS 2.

B. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

C. Other Applications:

1. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better. Mechanical platform sheathing shall be APA Rated Sheathing with 40/20 span rating, thickness as indicated on drawings.

2.03 ACCESSORIES

A. Fasteners and Anchors:

1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

B. Subfloor Glue: Waterproof, air cure type, cartridge dispensed.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

3.02 INSTALLATION OF CONSTRUCTION PANELS

A. Subflooring/Underlayment Combination: Glue and nail to framing; staples are not permitted.

B. Subflooring: Screw to framing with #10 self drilling screws at 12 inches on center.

C. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.

1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.

2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.

3. Install adjacent boards without gaps.

3.03 CLEANING

A. Waste Disposal: Comply with the requirements of Section 01 7419 - Construction Waste Management and Disposal.

1. Comply with applicable regulations.

2. Do not burn scrap on project site.

3. Do not burn scraps that have been pressure treated.

4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 1753

SHOP-FABRICATED WOOD TRUSSES- ADD ALTERNATE NO. 1

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated wood trusses for roof framing.

B. Bridging, bracing, and anchorage.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Installation requirements for miscellaneous framing.

B. Section 06 1000 - Rough Carpentry: Material requirements for blocking, bridging, plates, and miscellaneous framing.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

B. TPI 1 - National Design Standard for Metal-Plate-Connected Wood Truss Construction; 2007 and errata.

C. TPI DSB-89 - Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses; 1989.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Show truss configurations, sizes, spacing, size and type of plate connectors, cambers, framed openings, bearing and anchor details, and bridging and bracing.

1. Include identification of engineering software used for design.

2. Provide shop drawings stamped or sealed by design engineer.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Design to be prepared and sealed by a qualified Professional Engineer licensed in North Carolina.

B. Fabricator Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Handle and erect trusses in accordance with TPI BCSI 1.

B. Protect trusses from weather and condensation. Trusses showing discoloration, corrosion, or other evidence of deterioration must be inspected by the truss plate manufacturer or other

acceptable inspection agency before concealment. Replace trusses which inspection determines to be damaged or defective.

C. Store trusses in vertical position resting on bearing ends.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Truss Plate Connectors:

1. Alpine Engineered Products, Inc; 800-521-9790: www.alpeng.com.

2. MiTek Industries, Inc; 800-325-8075: www.mii.com.

3. Truswal Systems; 800-521-9790: www.truswal.com.

4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 TRUSSES

A. Wood Trusses: Designed and fabricated in accordance with TPI 1 and TPI DSB-89 to achieve structural requirements indicated.

1. Connectors: Steel plate.

2.03 MATERIALS

A. Lumber:

1. Moisture Content: Between 7 and 9 percent.

2. Lumber fabricated from old growth timber is not permitted.

B. Steel Connectors: Hot-dipped galvanized steel sheet, ASTM A653/A653M Structural Steel (SS) Grade 33/230, with G90/Z275 coating; die stamped with integral teeth; thickness as indicated.

C. Truss Bridging: Type, size and spacing recommended by truss manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that supports and openings are ready to receive trusses.

3.02 ERECTION

A. Install trusses in accordance with manufacturer's instructions and TPI DSB-89 and TPI BCSI 1; maintain a copy of each TPI document on site until installation is complete.

B. Set members level and plumb, in correct position.

C. Do not field cut or alter structural members without approval of Architect.

D. Install permanent bridging and bracing.

E. Frame openings between trusses with lumber in accordance with Section 06 1000.

3.03 TOLERANCES

A. Framing Members: 1/2 inch maximum, from true position.

END OF SECTION

SECTION 06 2000

FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 06 4100 - Architectural Wood Casework: Shop fabricated custom cabinet work.

1.03 REFERENCE STANDARDS

A. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

B. NHLA G-101 - Rules for the Measurement & Inspection of Hardwood & Cypress; 2011.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect work from moisture damage.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

2.02 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.03 LUMBER MATERIALS

A. Hardwood Lumber: oak species, quarter sawn sawn, maximum moisture content of 6 percent; with vertical grain, of quality suitable for transparent finish.

1. Grading: In accordance with NHLA G-101 Grading Rules; www.natlhardwood.org.

2.04 SHEET MATERIALS

A. Hardwood Plywood: Face species as indicated, plain sawn, book matched, medium density fiberboard core; low VOC glue type as recommended for application.

2.05 PLASTIC LAMINATE MATERIALS

A. Plastic Laminate: NEMA LD 3, HGS; textured, low gloss finish, architect to choose color from manufacturer's standard color pallette. Manufacturers: Wilson Art (Standard of Design), Formica, or Nevamar.

1. Counters: Wilson Art - "Green Tigris 4667-60".

2. Vertical Surfaces (Doors, Drawers, Cabinets) - Wilson Art - "Fusion Maple - 7909-60".

B. Laminate Adhesive: Type recommended by laminate manufacturer to suit application; not containing formaldehyde or other volatile organic compounds.

2.06 FASTENINGS

A. Concealed Joint Fasteners: Threaded steel.

2.07 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. Cap exposed plastic laminate finish edges with material of same finish and pattern.

C. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

D. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

PART 3 EXECUTION

3.01 INSTALLATION

A. Set and secure materials and components in place, plumb and level.

B. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

C. Install hardware supplied by Section _____ in accordance with manufacturer's written instructions.

3.02 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

3.03 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06 4100

ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Countertops.

C. Cabinet hardware.

D. Factory finishing.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

1.03 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.

C. BHMA A156.9 - American National Standard for Cabinet Hardware; 2010.

D. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

E. ANSI A135.4 - American National Standard for Basic Hardboard; 2012.

F. ANSI A208.1 - American National Standard for Particleboard; 2009.

G. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; 2009.

H. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

I. BHMA A156.9 - American National Standard for Cabinet Hardware; Builders Hardware Manufacturers Association; 2010 (ANSI/BHMA A156.9).

J. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 2005.

K. PS 1 - Structural Plywood; 2009.

L. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce); 2010.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Include floor plan view, indicate materials, component profiles and elevations, fastening methods, jointing details, accessories, hardware location, and schedule of finishes.

C. Product Data: Provide data for hardware accessories.

D. Submit laminate samples for color confirmation and/or selection.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Custom quality, unless other quality is indicated for specific items.

1. Illustrated, Custom quality, unless other quality is indicated for specific items.

B. Perform cabinet construction in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Custom quality, unless other quality is indicated for specific items.

C. Field measure prior to developing shop drawings and fabrication.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

PART 2 PRODUCTS

2.01 CABINETS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

2.02 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.03 LAMINATE MATERIALS

A. Manufacturers:

1. Formica Corporation: www.formica.com.

2. Panolam Industries International, Inc\Nevamar: www.nevamar.com.

3. Wilsonart; ____: www.wilsonart.com.

4. Substitutions: See Section 01 6000 - Product Requirements.

B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

2.04 COUNTERTOPS

A. Plastic Laminate Countertops: Medium density fiberboard substrate covered with HPDL, conventionally fabricated and self-edge banded.

2.05 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness.

C. Grommets: Standard plastic, painted metal, or rubber grommets for cut-outs, in color to match adjacent surface.

2.06 HARDWARE

A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

B. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, polished chrome finish, for nominal 1 inch spacing adjustments.

C. Drawer and Door Pulls: "U" shaped wire pull, aluminum with satin finish, 4 inch centers.

D. Hinges: European style concealed self-closing type, steel with polished finish.

2.07 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.

2. Cap exposed plastic laminate finish edges with material of same finish and pattern.

E. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

2.08 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. For opaque finishes, apply wood filler in exposed nail and screw indentations and sand smooth.

C. On items to receive transparent finishes, use wood filler matching or blending with surrounding surfaces and of types recommended for applied finishes.

D. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:

1. Transparent:

    a. System - 1, Lacquer, Nitrocellulose.

    b. Sheen: Flat.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

B. Use fixture attachments in concealed locations for wall mounted components.

C. Use concealed joint fasteners to align and secure adjoining cabinet units.

D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

E. Secure cabinets to floor using appropriate angles and anchorages.

3.03 ADJUSTING

A. Adjust installed work.

B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 07 1113

BITUMINOUS DAMP PROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Bituminous damp proofing.

1.02 REFERENCE STANDARDS

A. ASTM D41/D41M - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing; 2011.

B. ASTM D1227 - Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing; 2013.

C. ASTM D2822/D2822M - Standard Specification for Asphalt Roof Cement, Asbestos-Containing; 2005 (Reapproved 2011)e1.

D. ASTM D3747 - Standard Specification for Emulsified Asphalt Adhesive for Adhering Roof Insulation; 1979 (Reapproved 2007).

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures

.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The Euclid Chemical Company: Product Emulsified Asphalt Semi-Mastic

B. The Henry Company: Product 785 Asphalt Emulsion

C. The W.R. Meadows: Product Sealmastic Emulsion

D. Other Acceptable Bituminous Damp proofing Manufacturers:
   1. Substitutions: See Section 01 6000 - Product Requirements.

2.02 COLD ASPHALTIC MATERIALS

A. Bitumen: Asphalt emulsion, ASTM D3747.

B. Asphalt Primer: ASTM D41/D41M, compatible with substrate.

C. Reinforcing Fabric: Woven or unwoven glass fiber, treated with organic binders and coated for compatibility with damp proofing bitumen.

D. Detailing Mastic: Asphalt-based plastic roof cement, trowel consistency, meeting the requirements of ASTM D4586.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of damp proofing system.

C. Verify that items that penetrate surfaces to receive damp proofing are securely installed.

3.02 PREPARATION

A. Protect adjacent surfaces not designated to receive damp proofing.

B. Clean and prepare surfaces to receive damp proofing in accordance with manufacturer's instructions.

C. Do not apply damp proofing to surfaces unacceptable to manufacturer.

D. Apply mastic to seal penetrations, small cracks, or minor honeycomb in substrate.

3.03 APPLICATION

A. Apply bitumen with mop.

B. Apply bitumen in one coat, continuous and uniform, at a rate of 25 sq ft/gal per coat.

C. Seal items projecting through damp proofing surface with mastic. Seal watertight.

END OF SECTION

SECTION 07 2100

THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation and integral vapor retarder at perimeter foundation wall, underside of floor slabs, and exterior wall behind interior wall finish in Break Room & Office.

1.02 REFERENCE STANDARDS

A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2015a.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.01 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene Board Insulation: Extruded polystyrene board; ASTM C578; with either natural skin or cut cell surfaces, and the following characteristics:

1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.

2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.

3. R-value; 1 inch of material at 72 degrees F: 5, minimum.

4. Manufacturers:

a. Dow Chemical Company; www.dow.com.

b. Owens Corning Corporation; FOAMULAR Extruded Polystyrene (XPS) Insulation: www.ocbuildingspec.com/sle.

c. Kingspan Insulation LLC; Green Guard XPS TYPE IV 25 PSI: www.trustgreenguard.com.

5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ACCESSORIES

A. Provide accessories as necessary to properly install specified products.

1. Adhesive: Insulation manufacturer's recommended adhesive, complying with fire performance requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Install boards horizontally on foundation perimeter.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BOARD INSTALLATION AT EXTERIOR WALLS

A. Install boards horizontally on walls.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.04 BOARD INSTALLATION UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.05 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 2130

PRE-ENGINEERED BUILDING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Thermal insulation, interior vapor barrier liner, and support strapping for Pre-Engineered purlin roof installation.
- B. Fasteners and sealants.

1.02 REFERENCES
- A. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 1998.
- B. FS HH-I-558 - Insulation, Blankets, Thermal (Mineral Fiber, Industrial Type); Federal Specifications and Standards; Revision C, 1992.

1.03 PERFORMANCE REQUIREMENTS
- A. Provide insulating system forming a continuous vapor barrier inside of building purlins, girts, and insulation to provide complete isolation from inside conditioned air.

1.04 SUBMITTALS
- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's standard details and catalog data demonstrating compliance with referenced standards; installation instructions.

PART 2 PRODUCTS

2.01 MANUFACTURER
- A. Provide insulation, liner fabric, and accessories fabricated by Thermal Design, Inc., P.O. Box 468, 600 N. Main Street, Madison, NE 68748. Telephone 800-255-0776.
- B. Or equal by Bay Liner Fabric System, 2929 Walker Drive, Greenbay, WI 54308. Telephone 800-445-5947.
- C. Substitutions: See Section 01600 - Product Requirements.

2.02 MATERIALS
- A. Insulation: Fiberglass blanket or batt complying with FS HH-I-558, Form B, Type I; with the following R-value and nominal thickness: R-35, 8" thick between roof purlins with 3” upper roof insulation.
- B. Vapor Barrier Liner Fabric: Woven, reinforced, high-density polyethylene yarns coated on both sides with a continuous white or colored polyethylene film, minimum 3.2 mil thickness.
  1. Permeance of fabric and seams: 0.025 perms.
  2. Flame spread (ASTM E 84): Not more than 25.
  3. Smoke developed (ASTM E 84): Not more than 50.
  4. Size and seaming: Manufactured in large custom pieces by extrusion welding from roll goods, and fabricated to substantially fit defined building area with minimum practicable job site sealing.
  5. Stapled seams not acceptable.
  6. Factory-folded to allow for rapid pull-out on strap support system.
  7. Color: White.
- C. Vapor Barrier Lap Sealant: Fast tack solvent-based, synthetic rubber adhesive.
- D. Vapor Barrier Patch Tape: Double stick sealant tape made from same material as liner fabric.
- E. Straps: Woven polyester plastic.
- F. Fasteners:
  1. For light gage steel: #12 x 3/4 inch plated Tek 2 screws, painted to match specified color.

2. For heavy gage steel: #12 x 1-1/2 inch plated Tek 2 screws, painted to match specified color.
3. For wood, concrete, other materials: As recommended by manufacturer.

G. Thermal Spacer blocks

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building structure and building systems such as electrical conduit to be concealed are completed and approved.
B. Correct any unsatisfactory conditions before proceeding.

3.02 INSULATION SYSTEM INSTALLATION

A. Vapor Barrier Fabric: Install at underside of roof purlins.
1. Position pre-folded fabric on the strap platform along one eave purlin.
2. Clamp the two bottom corners at the eave and also centered on the bay.
3. Pull the other end of the pleat-folded fabric across the building width on the strap platform, fasten the straps and fabric in position at the purlin.
4. Once positioned, install fasteners from the bottom side at each strap/purlin intersection.
5. Trim edges and seal along the rafters.

B. Insulation: 8" thick, R-25, install between purlins.
1. Unpack and shake to a thickness exceeding the specified thickness.
2. Ensure that cavities are filled completely with insulation.
3. Place on the vapor barrier liner fabric without voids or gaps.
4. Place top layer of insulation over and perpendicular to the purlins without voids or gaps, as vapor barrier is applied. Continue and attach the insulation and vapor barrier to the adjacent existing wood attic plywood deck.

3.03 CLEANING

A. Remove scraps and debris from the site.

END OF SECTION

SECTION 07 3113

ASPHALT SHINGLES - ADD ALTERNATE NO. 1

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Asphalt shingle roofing.

B. Associated metal flashings and accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 2300 - Alternates-for alternate items included in this section.

B. Section 06 1000 - Rough Carpentry: Roof sheathing.

C. Section 07 7123 - Manufactured Gutters and Downspouts - Add Alternate No. 1.

1.03 REFERENCE STANDARDS

A. ASTM D225 - Standard Specification for Asphalt Shingles (Organic Felt) Surfaced with Mineral Granules; 2007.

B. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2009.

C. ASTM D3161/D3161M - Standard Test Method for Wind-Resistance of Steep Slope Roofing Products (Fan-Induced Method); 2016.

D. ASTM D3462/D3462M - Standard Specification for Asphalt Shingles Made From Glass Felt and Surfaced with Mineral Granules; 2010a.

E. ASTM D4869/D4869M - Standard Specification for Asphalt-Saturated Organic Felt Underlayment Used in Steep Slope Roofing; 2015.

F. NRCA MS104 - The NRCA Roofing Manual: Steep-slope Roof Systems; 2013.

G. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating material characteristics.

C. Shop Drawings: For metal flashings, indicate specially configured metal flashings.

D. Samples: Submit two samples of each shingle color indicating color range and finish texture/pattern; for color selection.

E. Manufacturer's Installation Instructions: Indicate installation criteria and procedures.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with the recommendations of NRCA MS104.

1.06 WARRANTY

A. Submit Manufacturer's Standard 30 years warranty on shingles.

B. Submit General Contractor workmanship 2 years warranty.

1.07 FIELD CONDITIONS

A. Do not install shingles or eave protection membrane when surface temperatures are below 45 degrees F.

PART 2 PRODUCTS

2.01 SHINGLES

A. Manufacturers:

1. GAF; Timberline HD Reflector Series: www.gaf.com/sle.

2. Owens Corning Corp: www.owenscorning.com.

3. Certainteed Roofing Products.

4. Substitutions: See Section 01 6000 - Product Requirements.

B. Asphalt Shingles: Asphalt-coated glass felt, mineral granule surfaced, complying with ASTM D3462; Class A fire resistance.

1. Weight: 300 lb/100 sq ft.

2. Color: As selected from standard palette by Architect..

2.02 ACCESSORIES

A. Nails: Standard round wire shingle type, of hot-dipped zinc coated steel, 10 wire gage, 0.1019 inch shank diameter, 3/8 inch head diameter, of sufficient length to penetrate through roof sheathing or 3/4 inch into roof sheathing or decking.

B. Lap Cement: Fibrated cutback asphalt type, recommended for use in application of underlayment, free of toxic solvents .

C. Ridge Vents: Plastic, extruded with vent openings that do not permit direct water or weather entry; flanged to receive shingles .

2.03 METAL FLASHINGS

A. Metal Flashings: Provide sheet metal eave edge, gable edge, ridge, ridge vents, open valley flashing, chimney flashing, dormer flashing, and other flashing indicated.

1. Form flashings to profiles indicated on Drawings.

2. Hem exposed edges of flashings minimum 1/4 inch on underside.

3. Coat concealed surfaces of flashings with bituminous paint.

B. Steel Sheet Metal: Prefinished and galvanized steel sheet, 26 gage, 0.0179 inch minimum thickness, G90/Z275 hot-dipped galvanized; PVC coated, color as selected.

C. Bituminous Paint: Acid and alkali resistant type; black color.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

B. Verify that deck is of sufficient thickness to accept fasteners.

C. Verify that roof penetrations and plumbing stacks are in place and flashed to deck surface.

D. Verify roof openings are correctly framed.

E. Verify deck surfaces are dry, free of ridges, warps, or voids.

3.02 PREPARATION

A. Seal roof deck joints wider than 1/16 inch as recommended by shingle manufacturer.

B. At areas where eave protection membrane is to be adhered to substrate, fill knot holes and surface cracks with latex filler.

C. Broom clean deck surfaces before installing underlayment or eave protection.

D. Install eave edge flashings tight with fascia boards. Weather lap joints 2 inches and seal with plastic cement. Secure flange with nails spaced 6 inches on center.

3.03 INSTALLATION - UNDERLAYMENT

A. Underlayment At Roof Slopes Up to 4:12: Install two layers of underlayment over area not protected by eave protection, with ends and edges weather lapped minimum 4 inches. Stagger end laps of each consecutive layer. Nail in place.

B. Items projecting through or mounted on roof: Weather lap and seal watertight with plastic cement.

3.04 INSTALLATION - VALLEY PROTECTION

A. Install one ply of smooth surfaced roll roofing, minimum 18 inches wide, centered over valleys.

B. Weather lap joints minimum 2 inches.

C. Nail in place minimum 18 inches on center, 1 inch from edges.

3.05 INSTALLATION - METAL FLASHING AND ACCESSORIES

A. Install flashings in accordance with NRCA requirements.

B. Weather lap joints minimum 2 inches and seal weather tight with plastic cement.

C. Items Projecting Through or Mounted on Roofing: Flash and seal weather tight with plastic cement.

3.06 INSTALLATION - SHINGLES

A. Install shingles in accordance with manufacturer's instructions.

1. Fasten individual shingles using 2 nails per shingle, or as required by code, whichever is greater.

2. Fasten strip shingles using 4 nails per strip, or as required by code, whichever is greater.

B. Place shingles in straight coursing pattern with 5 inch weather exposure to produce double thickness over full roof area. Provide double course of shingles at eaves.

C. Project first course of shingles 3/4 inch beyond fascia boards.

D. Extend shingles 1/2 inch beyond face of gable edge fascia boards.

E. Complete installation to provide weather tight service.

END OF SECTION

SECTION 07 4646

FIBER CEMENT SIDING- ADD ALTERNATE # 1

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wood-fiber cement siding, soffit & trim.

1.02 RELATED REQUIREMENTS

A. Section 01 2300 - Alternates-for alternate items included in this section.

B. Section 07 9005 - Joint Sealants: Sealing joints between siding and adjacent construction and fixtures.

1.03 REFERENCE STANDARDS

A. ASTM C1186 - Standard Specification for Flat Fiber Cement Sheets; 2008 (Reapproved 2012).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Manufacturer's requirements for related materials to be installed by others.

2. Preparation instructions and recommendations.

3. Storage and handling requirements and recommendations.

4. Installation methods, including nail patterns.

C. Color samples- submit 4"x6" samples for selection by Architect.

D. Test Report: Applicable model code authority evaluation report (e.g. ICC-ES).

E. Maintenance Instructions: Periodic inspection recommendations and maintenance procedures.

F. Warranty: Submit copy of manufacturer’s warranty, made out in NC DOT’s name, showing that it has been registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum 3 years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products under waterproof cover and elevated above grade, on a flat surface.

PART 2 PRODUCTS

2.01 SIDING

A. Lap Siding: Individual horizontal boards made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186 Type A Grade II; with machined edges, for nail attachment.

1. Style: Standard lap style.

2. Texture: Smooth.

3. Length: 12 ft, nominal.

4. Width (Height): 8-1/4 inches.

5. Thickness: 5/16 inch, nominal.

6. Finish: Unfinished.

7. Color: As selected by Architect from manufacturers full range of available colors.

8. Warranty: 50 year limited; transferable.

9. Lap Siding Manufacturers:

a. Allura, a division of Plycem USA, Inc: www.allurausa.com.

b. James Hardie Building Products, Inc: www.jameshardie.com.

c. Nichiha USA, Inc: www.nichiha.com.

d. Substitutions: See Section 01 6000 - Product Requirements.

B. Soffit Panels: Panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186 Type A Grade II; with machined edges, for nail attachment.

1. Texture: Smooth.

2. Length: 96 inches, nominal.

3. Width: 48 inches.

4. Thickness: 5/16 inch, nominal.

5. Finish: Factory applied topcoat.

6. Color: As selected by Architect from manufacturers full range of available colors.

7. Manufacturer: Same as siding.

2.02 ACCESSORIES

A. Trim: Same material and texture as siding.

B. Fasteners: Galvanized or corrosion resistant; length as required to penetrate minimum 1-1/4 inch.

C. Exterior Soffit Vents: One piece, perforated, solid vinyl, with edge suitable for direct application to gypsum board and manufactured especially for soffit application. Provide continuous vent.

D. Sealant: Elastomeric, polyurethane or silyl-terminated polyether/polyurethane, and capable of being painted.

PART 3 EXECUTION

3.01 PREPARATION

A. Examine substrate and clean and repair as required to eliminate conditions that would be detrimental to proper installation.

B. Do not begin until unacceptable conditions have been corrected.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and recommendations.

1. Read warranty and comply with all terms necessary to maintain warranty coverage.

2. Install in accordance with conditions stated in model code evaluation report applicable to location of project.

3. Use trim details indicated on drawings.

4. Touch up all field cut edges before installing.

5. Pre-drill nail holes if necessary to prevent breakage.

B. Joints in Horizontal Siding: Avoid joints in lap siding except at corners; where joints are inevitable stagger joints between successive courses.

C. Do not install siding less than 6 inches from surface of ground nor closer than 1 inch to roofs, patios, porches, and other surfaces where water may collect.

D. Exterior Soffit Vents: Install according to manufacturer's written instructions and in locations shown on the drawings. Provide vent area specified.

E. After installation, seal all joints except lap joints of lap siding. Seal around all penetrations. Paint all exposed cut edges.

3.03 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Final Acceptance.

END OF SECTION

SECTION 07 6200

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings and counterflashings.

B. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry: Metal flashings embedded in masonry.

B. Section 06 1000 - Rough Carpentry: Wood nailers for sheet metal work.

C. Section 07 3113 - Asphalt Shingles - Add Alternate No. 1: Non-metallic flashings associated with shingle roofing.

D. Section 07 7123 - Manufactured Gutters and Downspouts - Add Alternate No. 1.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.

C. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2009.

D. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2012).

E. CDA A4050 - Copper in Architecture - Handbook; current edition.

F. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Samples: Submit two samples __4"__x__4"__ inch in size illustrating metal finish color.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

B. Maintain one copy of each document on site.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage (0.0239 inch) thick base metal.

2.02 ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers.

B. Underlayment: ASTM D226/D226M, organic roofing felt, Type I ("No. 15").

C. Primer: Zinc chromate type.

D. Protective Backing Paint: Zinc molybdate alkyd.

E. Sealant to be Concealed in Completed Work: Non-curing butyl sealant.

F. Sealant to be Exposed in Completed Work: ASTM C920; elastomeric sealant, 100 percent silicone with minimum movement capability of plus/minus 25 percent and recommended by manufacturer for substrates to be sealed; clear.

G. Plastic Cement: ASTM D4586/D4586M, Type I.

2.03 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces, provide materials and types of fasteners, protective coatings, sealants, & other miscellaneous items as required for complete sheet metal flashing & trim installation & as recommended by manufacturer of primary sheet metal unless otherwise indicated..

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

PART 3 EXECUTION

3.01 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.02 INSTALLATION

A. Conform to drawing details.

B. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.

C. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Seal metal joints watertight.

END OF SECTION

SECTION 07 7123

MANUFACTURED GUTTERS AND DOWNSPOUTS - ADD ALTERNATE NO. 1

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pre-finished aluminum gutters and downspouts for Add Alternate No. 1 (Tire Storage Building). See Section 13 3419 "Metal Building Systems" for Manufacturer-Engineered Building gutters and downspout information.

B. Precast concrete splash pads.

1.02 RELATED REQUIREMENTS

A. Section 07 6200 - Sheet Metal Flashing and Trim.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.

B. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2015.

C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

D. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.

E. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Conform to SMACNA (ASMM) for sizing components for rainfall intensity determined by a storm occurrence of 1 in 5 years.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.

C. Product Data: Provide data on prefabricated components.

D. Samples: Submit two samples, 4 inch long illustrating component design, finish, color, and configuration.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.

B. Prevent contact with materials that could cause discoloration, staining, or damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gutters and Downspouts:

1. ATAS International, Inc: www.atas.com.

2. Cheney Flashing Company: www.cheneyflashing.com.

3. SAF Perimeter Systems, a division of Southern Aluminum Finishing Company, Inc; ____: www.saf.com/persys.

2.02 MATERIALS

A. Pre-Finished Aluminum Sheet: ASTM B209 (ASTM B209M); 0.032 inch thick.

1. Finish: Plain, shop pre-coated with modified silicone coating.

2. Color: As selected from manufacturer's standard colors by Architect.

2.03 COMPONENTS

A. Gutters: CDA rectangular style profile.

B. Downspouts: CDA Rectangular profile.

C. Anchors and Supports: Profiled to suit gutters and downspouts.

1. Anchoring Devices: In accordance with CDA requirements.

2. Gutter Supports: Brackets.

3. Downspout Supports: Brackets.

D. Fasteners: Galvanized steel, with soft neoprene washers.

2.04 ACCESSORIES

A. Splash Pads: Precast concrete type, size and profiles indicated; minimum 3000 psi at 28 days, with minimum 5 percent air entrainment.

2.05 FABRICATION

A. Form gutters and downspouts of profiles and size indicated.

B. Fabricate with required connection pieces.

C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.

D. Hem exposed edges of metal.

E. Fabricate gutter and downspout accessories; seal watertight.

2.06 FINISHES

A. Modified silicone polyester coating: Baked enamel system conforming to AAMA 2603.

B. Primer Coat: Finish concealed side of metal sheets with primer compatible with finish system, as recommended by finish system manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.

END OF SECTION

SECTION 07 9005

JOINT SEALERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sealants and joint backing.

B. Precompressed foam sealers.

1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping: Firestopping sealants.

B. Section 09 3000 - Tiling: Sealant used as tile grout.

1.03 REFERENCE STANDARDS

A. ASTM C834 - Standard Specification for Latex Sealants; 2014.

B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2012.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.

E. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2005 (Reapproved 2010).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating sealant chemical characteristics.

C. Manufacturer's Installation Instructions: Indicate special procedures.

1.05 QUALITY ASSURANCE

A. Maintain one copy of each referenced document covering installation requirements on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.06 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Final Acceptance.

C. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gunnable and Pourable Sealants:

1. BASF Construction Chemicals-Building Systems: www.buildingsystems.basf.com.

2. Bostik Inc: www.bostik-us.com.

3. Dow Corning Corporation: www.dowcorning.com.

4. Pecora Corporation: www.pecora.com.

5. Tremco Global Sealants: www.tremcosealants.com.

6. Sherwin-Williams Company: www.sherwin-williams.com.

7. W.R. Meadows, Inc: www.wrmeadows.com.

8. Substitutions: See Section 01 6000 - Product Requirements.

B. Preformed Compressible Foam Sealers:

1. EMSEAL Joint Systems, Ltd: www.emseal.com.

2. Sandell Manufacturing Company, Inc: www.sandellmfg.com.

3. Dayton Superior Corporation: www.daytonsuperior.com.

4. Tremco Global Sealants: www.tremcosealants.com.

5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SEALANTS

A. General Purpose Exterior Sealant: Polyurethane; ASTM C920, Grade NS, Class 25 minimum; Uses M, G, and A; single component.

1. Color: Match adjacent finished surfaces.

2. Applications: Use for:

a. Control, expansion, and soft joints in masonry.

b. Joints between concrete and other materials.

c. Joints between metal frames and other materials.

d. Other exterior joints for which no other sealant is indicated.

B. Exterior Expansion Joint Sealer: Pre-compressed foam sealer; urethane with water-repellent;

1. Face color: As selected from manufacturer's standard range. The color of expansion joints shall match the color of mortar.

2. Size as required to provide weathertight seal when installed.

3. Applications: Use for:

a. Exterior wall expansion joints.

C. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, Type OP, Grade NF single component, paintable.

1. Color: Match adjacent finished surfaces.

2. Applications: Use for:

a. Interior wall and ceiling control joints.

b. Joints between door and window frames and wall surfaces.

c. Other interior joints for which no other type of sealant is indicated.

D. Concrete Floor Joint Filler: Self-leveling, pourable, semi-rigid sealant intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.

1. Composition: Single or multi-part,100 percent solids by weight.

2. Hardness: 85 after 7 days, when tested in accordance with ASTM D2240 Shore A.

3. Color: To be selected by Architect from manufacturer's standard colors.

4. Joint Width: 1/8 inch.

5. Applications: Use for:

a. Control joints in concrete slabs and floors not filled with filler placed in form.

b. joints in concrete slabs and floors.

E. Interior Floor Joint Sealant: Polyurethane, self-leveling; ASTM C920, Grade P, Class 25, Uses T, M and A; single component.

1. Approved by manufacturer for wide joints up to 1-1/2 inches.

2. Color: Match adjacent finished surfaces.

3. Applications: Use for:

a. Expansion joints in floors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean and prime joints in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Protect elements surrounding the work of this section from damage or disfigurement.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Install bond breaker where joint backing is not used.

D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Tool joints concave.

G. Precompressed Foam Sealant: Do not stretch; avoid joints except at corners, ends, and intersections; install with face 1/8 to 1/4 inch below adjoining surface.

H. Concrete Floor Joint Filler: Install concrete floor joint filler per manufacturer's written instructions. After floor joint filler is fully cured, shave joint filler flush with top of concrete slab.

3.04 CLEANING

A. Clean adjacent soiled surfaces.

3.05 PROTECTION

A. Protect sealants until cured.

END OF SECTION

SECTION 08 1113

HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Thermally insulated hollow metal doors with frames.

1.02 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware.

B. Section 08 8000 - Glazing: Glass for doors and borrowed lites.

C. Section 09 9000: Painting and Coatings.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.

C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.

D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvan-nealed) by the Hot-Dip Process; 2015.

F. ASTM C1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus; 2011.

G. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2014.

H. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.

I. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.

J. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2012.

K. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes installation requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:

1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com.

2. Republic Doors: www.republicdoor.com.

3. Steelcraft, an Allegion brand: www.allegion.com/us.

4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DESIGN CRITERIA

A. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. Exterior Doors: Thermally insulated.

1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).

a. Level 1 - Standard-duty.

b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.

c. Model 1 - Full Flush.

d. Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.

2. Core Material: Vertical steel stiffeners with fiberglass batts.

3. Door Thermal Resistance: R-Value of 2.5.

4. Door Thickness: 1-3/4 inch, nominal.

5. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness.

6. Weather stripping: Refer to Section 08 7100.

B. Interior Doors, Non-Fire Rated:

1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).

a. Level 1 - Standard-duty.

b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.

c. Model 1 - Full Flush.

d. Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.

2. Core Material: Vertical steel stiffeners.

3. Door Thickness: 1-3/4 inch, nominal.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. General:

1. Comply with the requirements of grade specified for corresponding door.

a. ANSI/SDI A250.8 (SDI-100), Level 1 Door Frames: 16 gage, 0.053 inch, minimum thickness.

2. Finish: Factory primed, for field finishing.

3. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.

C. Exterior Door Frames: Fully welded, thermally broken frame.

1. Weatherstripping: Separate, see Section 08 7100.

2. Grind all welds smooth.

D. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.

1. Terminated Stops: Provide at interior doors; closed end stop terminated 6 inch, maximum, above floor at 45 degree angle.

2.05 ACCESSORIES

A. Glazing: As specified in Section 08 8000, factory installed.

B. Grout for Frames: Portland cement grout with maximum 4 inch slump for hand troweling; thinner pumpable grout is prohibited.

C. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

D. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

2.06 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Coordinate frame anchor placement with wall construction.

C. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

D. Coordinate installation of hardware.

E. Coordinate installation of glazing.

3.04 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified door and frame standards or custom guidelines indicated.

B. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

3.05 ADJUSTING

A. Adjust for smooth and balanced door movement.

3.06 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08 3613

SECTIONAL DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Overhead sectional doors, electrically operated.

B. Operating hardware and supports.

C. Electrical controls.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Rough wood framing for door opening.

B. Section 09 9113 - Exterior Painting: Finish painting.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

B. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

C. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

D. DASMA 102 - American National Standard Specifications for Sectional Overhead Type Doors; 2011.

E. NEMA MG 1 - Motors and Generators; 2014.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.

C. Product Data: Show component construction, anchorage method, and hardware.

D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals for warranty requirements.

B. Correct defective Work within a one year period after Date of Final Acceptance.

C. Provide five year manufacturer warranty from date of Final Acceptance for electric operating equipment.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. General Performance: Sectional doors shall comply with performance requirements specified without failure due to defective manufacture, fabrication, installation, or other defects in construction and without requiring temporary installation of reinforcing components.

B. Structural Performance, Exterior Doors: Capable of withstanding the positive and negative design wind loads indicated below.

1. Design Wind Load: Uniform pressure (velocity pressure) of 20 lbf/sq. ft. acting inward and outward.

2. Testing: According to ASTM E 330

2.02 MANUFACTURERS

A. Sectional Doors - Basis of Design: Overhead Door Co, Series 424.

B. Other Acceptable Manufacturers:

1. Fimbel Architectural Door Specialties: www.fimbelads.com.

2. Wayne-Dalton, a Division of Overhead Door Corporation: www.wayne-dalton.com.

3. Substitutions: See Section 01 6000 - Product Requirements.

2.03 STEEL DOOR COMPONENTS

A. Steel Doors: Flush steel, insulated; standard lift operating style with track and hardware; complying with DASMA 102, Commercial application.

1. Door Nominal Thickness: 2 inches thick.

2. Exterior Finish: Factory finished; with acrylic baked enamel from Mfgrs. full color range.

3. Interior Finish: Factory finished with acrylic baked enamel; white color.

4. Glazed Lights: Full panel width, one row; set in place with resilient glazing channel.

B. Glazing: Fully tempered glass; insulated; clear; 1/8 inch thick.

2.04 DOOR COMPONENTS

A. Hinge and Roller Assemblies: Heavy duty hinges and adjustable roller holders of galvanized steel; 3" floating hardened steel bearing rollers, located at top and bottom of each panel, each side.

B. Lift Mechanism: Torsion spring on cross head shaft, with braided galvanized steel lifting cables.

1. Overhead safety cords to be "retractable, made of braided galvanized steel cables, with a cord reel." Spiral-shaped cords (similar to telephone receiver cords) are not allowed, to prevent tangling.

C. Sill Weather stripping: Resilient hollow rubber strip, one piece; fitted to bottom of door panel, full length contact.

D. Jamb Weather stripping: Roll formed steel section full height of jamb, fitted with resilient weather stripping, placed in moderate contact with door panels.

E. Head Weather stripping: EPDM rubber seal, one piece full length.

F. Panel Joint Weather stripping: Neoprene foam seal, one piece full length.

G. Lock: Inside center mounted, adjustable keeper, spring activated latch bar with feature to retain in locked or retracted position; interior and exterior handle.

2.05 MATERIALS

A. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G60/Z180 coating, plain surface.

B. Float Glass: Provide float glass glazing, unless noted otherwise.

1. Heat-Strengthened and Fully Tempered Types: ASTM C1048.

C. Insulation: Foamed-in-place polyurethane, bonded to facing.

D. Metal Primer Paint: Zinc molybdate type.

2.06 ELECTRICAL OPERATION

A. Electrical Characteristics:

B. Motor: NEMA MG 1, Type 1.

C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

D. Disconnect Switch: Factory mount disconnect switch in control panel.

E. Electric Operator: Side mounted on cross head shaft, adjustable safety friction clutch; brake system actuated by independent voltage solenoid controlled by motor starter; enclosed gear driven limit switch; enclosed magnetic cross line reversing starter; mounting brackets and hardware.

F. Safety Edge: At bottom of door panel, full width; electro-mechanical sensitized type, wired to stop door upon striking object; hollow neoprene covered to provide weatherstrip seal.

G. Control Station: Standard three button (open-close-stop) momentary type control for each electric operator.

1. 24 volt circuit.

2. Surface mounted.

3. Locate at inside door jamb.

4. 4. Wash Bay control station to be NEMA4 rated for wet conditions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

B. Verify that electric power is available and of the correct characteristics.

3.02 PREPARATION

A. Prepare opening to permit correct installation of door unit to perimeter air and vapor barrier seal.

B. Apply primer to wood frame.

3.03 INSTALLATION

A. Install door unit assembly in accordance with manufacturer's instructions.

B. Anchor assembly to wall construction and building framing without distortion or stress.

C. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

D. Fit and align door assembly including hardware.

E. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

3.04 TOLERANCES

A. Maximum Variation from Plumb: 1/16 inch.

B. Maximum Variation from Level: 1/16 inch.

C. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10 ft straight edge.

D. Maintain dimensional tolerances and alignment with adjacent work.

3.05 ADJUSTING

A. Adjust door assembly for smooth operation and full contact with weatherstripping.

B. Have manufacturer's field representative present to confirm proper operation and identify adjustments to door assembly for specified operation.

3.06 CLEANING

A. Clean doors and frames and glazing.

B. Remove temporary labels and visible markings.

3.07 PROTECTION

A. Protect installed products from damage until Date of Final Acceptance.

B. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

END OF SECTION

SECTION 08 5113

ALUMINUM WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Extruded aluminum windows with fixed sash, operating sash, and infill panels.

B. Factory glazing.

C. Operating hardware.

D. Insect screens.

1.02 RELATED REQUIREMENTS

A. Section 04 2000- Unit Masonry: Preparation of adjacent work to receive work of this section.

B. Section 07 9005 - Joint Sealants: Sealing joints between window frames and adjacent construction.

C. Section 08 8000 - Glazing.

1.03 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights; 2011.

B. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.

C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.

D. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

E. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 2013.

F. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.

G. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; American Architectural Manufacturers Association; 2012.

H. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.

I. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

J. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

K. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

L. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.

M. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

N. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2009).

O. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015.

P. ASTM F588 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact; 2014.

Q. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.04 PERFORMANCE REQUIREMENTS

A. Performance Requirements: As specified in PART 2, with the following additional requirements:

1. Design and size windows to withstand the following load requirements, when tested in accordance with ASTM E 330 using test loads equal to 1.5 times the design wind loads with 10 second duration of maximum load:

   a. Design Wind Loads: Comply with requirements of ASCE 7.

   b. Positive Design Wind Load: 40 lbf/sq ft.

   c. Negative Design Wind Load: 43.6 lbf/sq ft.

   d. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.

2. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.

3. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, or migrating moisture occurring within system.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, anchorage and fasteners, glass, internal drainage details.

C. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, method for achieving air and vapor barrier seal to adjacent construction, anchorage locations, _____, and installation requirements.

D. Samples: Submit two samples, 12 by 12 inch in size illustrating typical corner construction, accessories, and finishes.

E. Submit two samples of operating hardware.

F. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:

1. Evidence of AAMA Certification.

2. Evidence of WDMA Certification.

3. Evidence of CSA Certification.

4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.

G. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of AAMA CW-10.

B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F.

B. Maintain this minimum temperature during and 24 hours after installation of sealants.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Final Acceptance.

C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Aluminum Windows:

1. EFCO, a Pella Company: www.efcocorp.com.

2. TRACO: www.traco.com.

3. YKK AP America Inc: www.ykkap.com.

4. Kawneer, An Alcoa Company; www.kawneer.com.

5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 WINDOWS

A. Aluminum Windows: Extruded aluminum frame and sash, factory fabricated, factory finished, with operating hardware, related flashings, and anchorage and attachment devices.

1. Frame Depth: 4-1/2 inches.

2. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for operating hardware and imposed loads.

3. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

4. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.

5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.

B. Performance Requirements: Provide products that comply with the following:

1. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific window type:

a. Performance Class (PC): R.

C. Fixed, Non-Operable Type:

1. Construction: Thermally broken.

2. Glazing: Single; clear; low-e.

3. Exterior Finish: Class I natural anodized.

4. Interior Finish: Class I natural anodized.

D. Horizontal Pivoting Type:

1. Construction: Thermally broken.

2. Provide screens.

3. Glazing: Single; clear; low-e.

4. Exterior Finish: Class I natural anodized.

5. Interior Finish: Class I natural anodized.

2.03 COMPONENTS

A. Frames: 1 ½" inch wide by 4 ½" inch deep profile, of 1/8" inch thick section; thermally broken with interior portion of frame insulated from exterior portion; flush glass stops of snap-on type.

B. Glazing: As specified in Section 08 8000.

C. Operable Sash Weather stripping: Wool pile; permanently resilient, profiled to achieve effective weather seal.

D. Glazing Materials: As specified in Section 08 8000.

E. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

2.05 HARDWARE

A. Sash lock: Lever handle with cam lock .

B. Operator: Lever action handle fitted to projecting sash arms with limit stops.

C. Projecting Sash Arms: Cadmium plated steel, friction pivot joints with nylon bearings, removable pivot clips for cleaning.

D. Pulls: Manufacturer's standard type.

E. Bottom Rollers: Stainless steel, adjustable.

F. Limit Stops: Resilient rubber.

2.06 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

B. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings and adjoining air and vapor seal materials are ready to receive aluminum windows.

3.02 INSTALLATION

A. Install windows in accordance with manufacturer's instructions.

B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

D. Install sill and sill end angles.

E. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

F. Install operating hardware not pre-installed by manufacturer.

G. Install glass and infill panels in accordance with requirements specified in Section 08 8000.

3.03 TOLERANCES

A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft non-cumulative or 1/8 inches per 10 ft, whichever is less.

3.04 FIELD QUALITY CONTROL

A. Test installed windows for compliance with performance requirements for water penetration, in accordance with ASTM E1105 using uniform pressure and the same pressure difference as specified for laboratory testing.

1. If any window fails, test additional windows at Contractor's expense.

B. Replace windows that have failed field testing and retest until performance is satisfactory.

3.05 ADJUSTING

A. Adjust hardware for smooth operation and secure weathertight closure.

3.06 CLEANING

A. Remove protective material from factory finished aluminum surfaces.

END OF SECTION

SECTION 08 7100

DOOR HARDWARE

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames.

1.02 REFERENCE STANDARDS

A. BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches; 2011.

B. BHMA A156.3 - American National Standard for Exit Devices; 2014.

C. BHMA A156.6 - American National Standard for Architectural Door Trim; 2010.

D. BHMA A156.8 - American National Standard for Door Controls - Overhead Stops and Holders; 2010.

E. BHMA A156.13 - American National Standard for Mortise Locks & Latches Series 1000; 2012.

F. BHMA A156.17 - American National Standard for Self Closing Hinges & Pivots; 2014.

G. BHMA A156.21 - American National Standard for Thresholds; 2014.

H. BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems, Builders Hardware Manufacturers Association; 2012.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project.

C. Hardware Schedule: Detailed listing of each item of hardware to be installed on each door. Use door numbering scheme as included in the Contract Documents. Identify electrically operated items and include power requirements.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year warranty for door closers.

PART 2 PRODUCTS

2.01 DOOR HARDWARE - GENERAL

A. Provide hardware specified or required to make doors fully functional, compliant with applicable codes, and secure to the extent indicated.

B. Provide items of a single type of the same model by the same manufacturer.

C. Provide products that comply with the following:

1. Applicable provisions of federal, state, and local codes.

2. Hardware for Smoke and Draft Control Doors (Indicated as "S" on Drawings): Provide hardware that enables door assembly to comply with air leakage requirements of the applicable code.

2.02 LOCKS AND LATCHES

A. Locks: Provide a lock for every door, unless specifically indicated as not requiring locking.

1. If no hardware set is indicated for a swinging door provide an office lockset.

2. Trim: Provide lever handle or pull trim on outside of all locks unless specifically stated to have no outside trim.

3. Lock Cylinders: Provide key access on outside of all locks unless specifically stated to have no locking or no outside trim.

B. Lock Cylinders: Manufacturer’s standard tumbler type, six-pin standard core.

1. Provide cams and/or tailpieces as required for locking devices required.

C. Keying: Grand master keyed.

D. Latches: Provide a latch for every door that is not required to lock, unless specifically indicated "push/pull" or "not required to latch".

2.03 HINGES

A. Hinges: Provide hinges on every swinging door.

1. Provide five-knuckle full mortise butt hinges unless otherwise indicated.

2. Provide ball-bearing hinges at all doors having closers.

3. Provide hinges in the quantities indicated.

4. Provide non-removable pins on exterior out-swinging doors.

5. Where electrified hardware is mounted in door leaf, provide power transfer hinges.

B. Manufacturers - Hinges:

1. Assa Abloy Brands; McKinney: www.assaabloydss.com.
2. Bommer Industries, Inc; www.bommer.com.
3. Hager Companies; www.hagerco.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

2.04 PIVOTS

A. Pivots: Comply with BHMA A156.17.

B. Manufacturers - Pivots:

1. Assa Abloy Brands, McKinney or Rixson; www.assaabloydss.com.
2. DORMA USA, Inc; LM Series: www.dorma.com.
3. Ives, an Allegion brand; www.allegion.com/us.
4. Substitutions: See Section 01 6000 - Product Requirements.

2.05 PUSH/PULLS

A. Push/Pulls: Comply with BHMA A156.6.

1. Provide push and pull on doors not specified to have lockset, latch-set, exit device, or auxiliary lock.
2. On solid doors, provide matching push plate and pull plate on opposite faces.

B. Manufacturers - Push/Pulls:

1. Assa Abloy Brands, McKinney; www.assaabloydss.com.
2. Hager Companies; www.hagerco.com.
3. Trimco Hardware; www.trimcohardware.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

2.06 CYLINDRICAL LOCKSETS

A. Locking Functions: As defined in BHMA A156.2, and as follows.

B. Manufacturers - Cylindrical Locksets:

1. Assa Abloy Brands, Corbin Russwin, Sargent, or Yale; www.assaabloydss.com.
2. Hager Companies; www.hagerco.com.
3. Schlage, an Allegion brand; www.allegion.com/us.

4. Substitutions: See Section 01 6000 - Product Requirements.

2.07 MORTISE LOCKSETS

A. Locking Functions: As defined in BHMA A156.13, and as follows:

B. Manufacturers - Mortise Locksets:

1. Assa Abloy Brands, Corbin Russwin, Sargent, or Yale; www.assaabloydss.com.

2. Hager Companies; www.hagerco.com.

3. Schlage, an Allegion brand; www.allegion.com/us.

4. Substitutions: See Section 01 6000 - Product Requirements.

2.09 EXIT DEVICES

A. Locking Functions: Functions as defined in BHMA A156.3, and as follows:

B. Manufacturers - Exit Devices:

1. Assa Abloy Brands, Corbin Russwin, Sargent, or Yale; www.assaabloydss.com.

2. DORMA USA, Inc; 8000 Series, 9000 Series, DG1000 Series, and DG1100 Series: www.dorma.com.

3. Von Duprin, an Allegion brand; www.allegion.com/us.

2.10 CLOSERS

A. Manufacturers - Surface Mounted Closers:

1. Assa Abloy Brands, Corbin Russwin, Norton, Rixson, Sargent, or Yale; www.assaabloydss.com.

2. DORMA USA, Inc; 7400 Series, 8600 Series, 8900 Series, and TS93: www.dorma.com.

3. LCN, an Allegion brand; www.allegion.com/us.

4. Substitutions: See Section 01 6000 - Product Requirements.

2.11 STOPS AND HOLDERS

A. Stops: Complying with BHMA A156.8; provide a stop for every swinging door, unless otherwise indicated.

1. Provide wall stops, unless otherwise indicated.

2. If wall stops are not practical, due to configuration of room or furnishings, provide overhead stop.

3. Stop is not required if positive stop feature is specified for door closer; positive stop feature of door closer is not an acceptable substitute for a stop unless specifically so stated.

B. Manufacturers - Wall and Floor Stops/Holders:

1. Assa Abloy Brands, McKinney; www.assaabloydss.com.

2. Hager Companies; www.hagerco.com.

3. Trimco Hardware; www.trimcohardware.com.

4. Substitutions: See Section 01 6000 - Product Requirements.

2.12 GASKETING AND THRESHOLDS

A. Gaskets: Complying with BHMA A156.22.

1. On each door in smoke partition, provide smoke gaskets; top, sides, and meeting stile of pairs. If fire/smoke partitions are not indicated on drawings, provide smoke gaskets on each door identified as a "smoke door" and 20-minute rated fire doors.

2. On each exterior door, provide weatherstripping gaskets, unless otherwise indicated; top, sides, and meeting stiles of pairs.

a. Where exterior door is also required to have fire or smoke rating, provide gaskets functioning as both smoke and weather seals.

3. On each exterior door, provide door bottom sweep, unless otherwise indicated.

B. Thresholds: Complying with BHMA A156.21.

1. At each exterior door, provide a threshold unless otherwise indicated.

C. Manufacturers - Gasketing and Thresholds:

1. Assa Abloy Brands, McKinney; www.assaabloydss.com.

2. Pemko Manufacturing Co; www.pemko.com.

3. Zero International, Inc; www.zerointernational.com.

4. Substitutions: See Section 01 6000 - Product Requirements.

2.13 GENERAL REQUIREMENTS FOR DOOR HARDWARE PRODUCTS

A. Provide products that comply with the following:

1. Applicable provisions of Federal, State, and local codes.

B. Finishes: US 626D

2.14 KEYING

A. Door Locks: Grand master keyed.

B. Supply keys in the following quantities:

1. 4 master keys.

2. 2 grand master keys.

3. 3 change keys for each lock.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Use templates provided by hardware item manufacturer.

C. Mounting heights for hardware from finished floor to center line of hardware item.

D. Set exterior door thresholds in a bed of either butyl rubber sealant or polyisobutylene mastic sealant to completely fill concealed voids and exclude moisture from every source, providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws. Remove excess sealant.

3.02 CONTRACT CLOSEOUT

SET# HW-1

3 Hinge	**BB51 4.5 X 4.5 X USP US32D**
1 Entry Mortise Lockset	**ML9050C-LTA-626-134-5006**
1 Door Closer	**7436-ARP-689**
1 Set Weather Stripping	
1 Threshold	**412S X MIL X 36"**
1 Door Sweep	**756SV X MILX 36"**

SET# HW-2

3 Hinge	**BB514.5 X 4.5 US32D**
1 Classroom Mortise Lockset	**ML9070C-LTA-626 -134-5006**
1 Door Closer	**7436-ARP-689**
1 Set Weather Stripping	
1 Wall Stop	**236W X US32D**
3 Silencer	**307D X GRAY**

3.03 HARDWARE SCHEDULE

3.03 HARDWARE SCHEDULE

SET # HW-3

3 Hinge BB514.5 X 4.5 US32D
1 Privacy Mortise Lockset ML9040C-LTA-626-134-5006
1 Door Closer 7436-ARP-689
1 Kick Plate 190S 8" X 34" US32D
1 Wall Stop 236W X US32D
3 Silencer 307DX GRAY

SET # HW-4

3 Hinge BB514.5 X 4.5 US32D
1 Push Plate 30S 4" x 16 " US32D
1 Pull Plate 33G 4" x 16 " US32D
1 Door Closer 7436-ARP-689
1 Kick Plate 190S 8" x 34" US32D
3 Silencer 307DX GRAY

SET# HW-5

6 Hinge BB514.5X4.5XUSP
1 Entry Mortise Lockset ML9050C- LTA -626-134-5006
2 Door Closers 7436-ARP-689
1 Set Weather Stripping
1 Threshold 4125 x MIL x 72
2 Door Sweeps 7565V x MIL x 36

SET #HW-6

1 Hinge BB514.5 X 4.5 US32D
1 Passage Mortise Set ML9010C-LTA-626-134-5006
1 Door Closer 7436-FHP-689
1 Wall Stop 26W x US32D
1 Set Weather Stripping
1 Threshold 412S x MIL x 36”
1 Door Sweep 756SV x MIL x 36”

SET #HW-7

1 Hinge BB514.5 X 4.5 US32D
1 Passage Mortise Set ML9010C-LTA-626-134-5006
1 Door Closer w/ Hold Open 7436-ARP-689
1 Wall Stop 26W x US32D
1 Set Weather Stripping
1 Threshold 412S x MIL x 36”
1 Door Sweep 756SV x MIL x 36”

SET # HW-8

3 Hinge BB514.5 X 4.5 US32D
1 Classroom Mortise Lockset ML9070C-LTA-626-134-5006 1 Door Closer w/ Hold Open 7436-ARP-689
1 Wall Stop 236W X US32D
3 Silencer 307D X GRAY

SET # HW-9

3 Hinge BB514.5 X 4.5 US32D
1 Classroom Mortise Lockset ML9070C-LTA-626-134-5006 1 Wall Stop 236W X US32D
3 Silencer 307D X GRAY

SET# HW-10 Overhead Doors; Hardware by Door Supplier

SECTION 08 8000

GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass.

B. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.

B. Section 08 5113 - Aluminum Windows: Glazing furnished by window manufacturer.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.

B. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.

C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2011).

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.

E. ASTM C1036 - Standard Specification for Flat Glass; 2011.

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

G. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2014.

H. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.

I. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2012a.

J. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.

K. GANA (GM) - GANA Glazing Manual; 2009.

L. GANA (SM) - GANA Sealant Manual; 2008.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.

D. Certificates: Certify that products meet or exceed specified requirements.

E. Manufacturer's Certificate: Certify that sealed insulated glass meets or exceeds specified requirements.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with GANA Glazing Manual and GANA Sealant Manual for glazing installation methods.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Sealed Insulating Glass Units: Provide a five (5) year warranty to include coverage for seal failure, inter-pane dusting or misting, including replacement of failed units.

C. Laminated Glass: Provide a five (5) year warranty to include coverage for delamination, including replacement of failed units.

PART 2 PRODUCTS

2.01 INSULATING GLASS UNITS

A. Type G-1 – 1” Sealed Low E Insulating Glass Units: Vision glass, double glazed.

1. Application: All exterior window (fixed & awning) glazing unless otherwise indicated.

2. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.

a. Tint: Bronze.

3. Inboard Lite: Annealed float glass, 1/4 inch thick, minimum.

a. Tint: Clear.

4. Total Thickness: 1 inch.

2.02 INSULATING GLASS UNITS

A. Type G-2 – 1” Tempered Insulating Glass Units: Vision Glass

1. Application: Provide this type of glazing in the following locations:

a. Lites in overhead doors.

2. Type: Fully tempered float glass as specified.

3. Tint: Clear.

4. Thickness: 1 inch total thickness.

2.03 INTERIOR DOOR LIGHTS

A. Type G-3 & 4 – Interior Single Safety Glazing:

1. Application: Provide this type of glazing in the following locations:

a. Glazed lites in doors.

b. Glazed sidelights to doors.

c. Other locations required by applicable federal, state, and local codes and regulations.

d. Other locations indicated on the drawings.

2. Type: Fully tempered float glass as specified.

3. Tint: Clear.

4. Thickness: 1/4 inch or 5/8 inch. See glazing schedule on Sheet A6.0

2.04 EXTERIOR GLAZING ASSEMBLIES

A. Performance Criteria: Select type and thickness of glass to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of glass.

1. Use the procedure specified in ASTM E1300 to determine glass type and thickness.

2. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.

3. Glass thicknesses listed are minimum.

2.05 GLASS MATERIALS

A. Float Glass Manufacturers:

1. Cardinal Glass Industries: www.cardinalcorp.com.

2. Pilkington North America Inc: www.pilkington.com/na.

3. PPG Industries, Inc: www.ppgideascapes.com.

4. Substitutions: Refer to Section 01 6000 - Product Requirements.

B. Float Glass: Provide float glass based glazing unless noted otherwise.

1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality-Q3.

2. Heat-Strengthened and Fully Tempered Types: ASTM C1048, Kind HS and Kind FT.

3. Tinted Types: ASTM C1036, Class 2 - Tinted, color and performance characteristics as indicated.

4. Thicknesses: As indicated; for exterior glazing comply with requirements indicated for wind load design regardless of thickness indicated.

2.06 SEALED INSULATING GLASS UNITS

A. Sealed Insulating Glass Units: Types as indicated.

1. Durability: Certified by an independent testing agency to comply with ASTM E2190.

2. Edge Spacers: Aluminum, bent and soldered corners.

3. Edge Seal: Glass to elastomer with supplementary silicone sealant.

4. Purge interpane space with dry hermetic air.

2.07 GLAZING COMPOUNDS

A. Manufacturers:

1. Bostik Inc: www.bostik-us.com.

2. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com.

3. Pecora Corporation: www.pecora.com.

4. BASF Construction Chemicals-Building Systems: www.buildingsystems.basf.com.

5. Substitutions: Refer to Section 01 6000 - Product Requirements.

B. Glazing Putty: Polymer modified latex recommended by manufacturer for outdoor use, knife grade consistency; grey color.

C. Butyl Sealant: Single component; ASTM C920, Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.

D. Polyurethane Sealant: Single component, chemical curing, non-staining, non-bleeding; ASTM C920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 20 to 35; color as selected.

E. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

2.08 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.

C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; hardness range of 5 to 30 cured Shore A durometer; coiled on release paper; black color.

1. Width: As required for application.

2. Thickness: As required for application.

3. Spacer Rod Diameter: As required for application.

4. Manufacturers:

a. Pecora Corporation: www.pecora.com.

b. Tremco Global Sealants: www.tremcosealants.com.

c. Saint-Gobain Performance Plastics: www.plastics.saint-gobain.com.

d. Substitutions: Refer to Section 01 6000 - Product Requirements.

D. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; clear color.

E. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerance.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant.

D. Install sealants in accordance with ASTM C1193 and GANA Sealant Manual.

E. Install sealants in accordance with manufacturer's instructions.

3.03 INSTALLATION - EXTERIOR WET/DRY METHOD (PREFORMED TAPE AND SEALANT)

A. Cut glazing tape to length and set against permanent stops, 3/16 inch below sight line. Seal corners by butting tape and dabbing with butyl sealant.

B. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.

C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

D. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of pane or glass unit.

E. Install removable stops, with spacer strips inserted between glazing and applied stops 1/4 inch below sight lines.

1. Place glazing tape on glazing pane of unit with tape flush with sight line.

F. Fill gap between glazing and stop with polysulfide type sealant to depth equal to bite of frame on glazing, but not more than 3/8 inch below sight line.

G. Apply cap bead of polysulfide type sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.04 INSTALLATION - INTERIOR WET/DRY METHOD (TAPE AND SEALANT)

A. Cut glazing tape to length and install against permanent stops, projecting 1/16 inch above sight line.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.

D. Install removable stops, spacer shims inserted between glazing and applied stops at 24 inch intervals, 1/4 inch below sight line.

E. Fill gaps between pane and applied stop with acrylic emulsion latex type sealant to depth equal to bite on glazing, to uniform and level line.

F. Trim protruding tape edge.

3.05 INSTALLATION - INTERIOR WET METHOD (COMPOUND AND COMPOUND)

A. Install glazing resting on setting blocks. Install applied stop and center pane by use of spacer shims at 24 inch centers, kept 1/4 inch below sight line.

B. Locate and secure glazing pane using glazers' clips.

C. Fill gaps between glazing and stops with glazing compound until flush with sight line. Tool surface to straight line.

3.06 CLEANING

A. Remove glazing materials from finish surfaces.

B. Remove labels after Work is complete.

C. Clean glass and adjacent surfaces.

3.07 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

3.08 GLAZING SCHEDULE

A. Tempered and laminated safety glass requirements for specific locations shall be as shown on the drawings or as required by code or code official. Adjust scheduled glass elements where required to meet safety requirements while maintaining conformance to performance specifications for each scheduled location as closely as possible.

END OF SECTION

SECTION 09 2116

GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal stud wall framing.

B. Acoustic insulation.

C. Gypsum wallboard.

D. Joint treatment and accessories.

1.02 REFERENCE STANDARDS

A. ANSI A108.11 - American National Standard for Interior Installation of Cementitious Backer Units; 2010 (Revised).

B. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (Reaffirmed 2010).

C. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.

D. ASTM C514 - Standard Specification for Nails for the Application of Gypsum Board; 2004 (Reapproved 2014).

E. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2014.

F. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.

G. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2015.

H. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2013.

I. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2014.

J. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.

K. ASTM C1280 - Standard Specification for Application of Gypsum Sheathing Board; 2013.

L. ASTM C1325 - Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units; 2014.

M. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2014.

N. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.

O. GA-216 - Application and Finishing of Gypsum Board; 2013.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on gypsum board, accessories, and joint finishing system.

1.04 QUALITY ASSURANCE

A. Copies of Documents at Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

2.02 METAL FRAMING MATERIALS

A. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.

1. Studs: "C" shaped with flat or formed webs with knurled faces.

2. Runners: U shaped, sized to match studs.

3. Furring: Hat-shaped sections, minimum depth of 7/8 inch.

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:

1. American Gypsum Company: www.americangypsum.com.

2. CertainTeed Corporation: www.certainteed.com.

3. Continental Building Products: www.continental-bp.com.

4. Georgia-Pacific Gypsum: www.gpgypsum.com.

5. National Gypsum Company: www.nationalgypsum.com.

6. Substitutions: See Section 01 6000 - Product Requirements.

B. Moisture Resistant Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.

1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.

2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

    a. Mold resistant board is required at all locations.

3. Thickness:

    a. Vertical Surfaces: 5/8 inch.

2.04 ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: _____ inch.

B. Acoustic Insulation: 1; preformed glass fiber, friction fit type, unfaced. Thickness: __ inch.

C. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.

1. Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.

2. Ready-mixed vinyl-based joint compound.

E. High Build Drywall Surfacer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.

F. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

A. Standard Wall Furring: Install at concrete walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.04 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.

B. Corner Beads: Install at external corners, using longest practical lengths.

3.06 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:

1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.

2. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

1. Feather coats of joint compound so that camber is maximum 1/32 inch.

C. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.07 TOLERANCES

END OF SECTION

SECTION 09 3000

TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for shower receptors.

B. Stone thresholds.

C. Ceramic trim.

1.02 RELATED REQUIREMENTS

A. Section 07 9005 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.

1.03 REFERENCE STANDARDS

A. ANSI A108/A118/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2013.1.

B. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2014.

C. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).

D. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex-Portland Cement; 1999 (Reaffirmed 2010).

E. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive; 2009 (Revised).

F. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).

G. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy; 1999 (Reaffirmed 2010).

H. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2010).

I. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 1999 (Reaffirmed 2010).

J. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 1999 (Reaffirmed 2010).

K. ANSI A108.11 - American National Standard for Interior Installation of Cementitious Backer Units; 2010 (Revised).

L. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).

M. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2010).

N. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive; 2013 (Revised).

O. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes For Thin-Set Ceramic Tile And Dimension Stone Installation; 2014.

P. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2013.1.

Q. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

R. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2011.

S. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2015.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

D. Samples: Submit full size tile samples and grout samples, to confirm specified color selections and allow for the selection of alternate colors if products are discontinued or if a manufacturer different from the 'basis for design manufacturer'' is submitted.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

G. Maintenance Materials: Furnish the following for NC DOT's use in maintenance of project.

1. See Section 01 6000 - Product Requirements, for additional provisions.

2. Extra Tile: 1 percent of each size, color, and surface finish combination, but not less than 4 of each type.

1.05 QUALITY ASSURANCE

A. Maintain one copy of and ANSI A108/A118/A136.1 and TCNA (HB) on site.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.

PART 2 PRODUCTS

2.01 TILE

A. Manufacturers: All products by the same manufacturer.

1. American Olean Corporation: www.americanolean.com.

2. Dal-Tile Corporation: www.daltile.com.

3. Crossville, Inc..

4. Substitutions: See Section 01 6000 - Product Requirements.

B. Ceramic Mosaic Tile, Type Porcelain, in shower: ANSI A137.1, and as follows:

1. Moisture Absorption: 0 to 0.5 percent.

2. Size and Shape: 2 inch square.

3. Edges: Square.

4. Surface Finish: Slip resistant, with abrasive admixture..

5. Color(s): To be selected by Architect from manufacturer's full range.

6. Trim Units: Matching cove and surface bullnose shapes in sizes coordinated with field tile.

2.02 TRIM AND ACCESSORIES

A. Ceramic Trim: Matching bullnose, double bullnose, cove base, and cove ceramic shapes in sizes coordinated with field tile.

1. Manufacturers: Same as for tile.

B. Thresholds: Marble, white or gray, honed finish; 2 inches wide by full width of wall or frame opening; 1/2 inch thick; beveled one long edge with radius corners on top side; without holes, cracks, or open seams.

1. Applications:

    a. At doorways where tile terminates.

    b. At open edges of floor tile where adjacent finish is a different height.

2.03 SETTING MATERIALS

A. Mortar Bed Materials: Pre-packaged mix of Portland cement, sand, latex additive, and water.

2.04 GROUTS

A. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable 100% solids epoxy grout.

    1. Applications: Where indicated.

    2. Color(s): As selected by Architect from manufacturer's full line.

B. Mix in accordance with manufacturer's recommendations.

2.05 MAINTENANCE MATERIALS

A. Tile Sealant: Gunnable, silicone, siliconized acrylic, or urethane sealant; moisture and mildew resistant type.

    1. Applications: control joints; color shall match tile grout color.

2.06 ACCESSORY MATERIALS

A. Waterproofing Membrane at Floors: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.

    1. Type: Bonded Sheet Membrane.

C. Waterproofing Membrane at Showers and Tiled Tubs: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.

    1. Type: Trowel-applied.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.

C. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within the following limits:

    1. Moisture Emission Rate: Not greater than 3 lb per 1000 sq ft per 24 hours, test in accordance with ASTM F1869.

2. Alkalinity (pH): Verify pH range of 5 to 9, test in accordance with ASTM F710.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

3.03 INSTALLATION - GENERAL

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" (2015 Edition) for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials listed below.

1. Concrete Floors on grade: TCNA installation Method F1160-16 or approved equal.

2. Metal Stud Walls with tile over gypsum board: TNAC installation Method W242-16 or approved equal.

3. Shower base and walls: TNAC Installation Method SR614-16 or approved equal

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

D. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

E. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

F. Form internal angles square and external angles bull nosed.

G. Sound tile after setting. Replace hollow sounding units.

H. Keep control and expansion joints free of mortar, grout, and adhesive.

I. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

J. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.

K. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - SHOWERS AND BATHTUB WALLS

A. Grout with standard grout as specified above.

3.05 CLEANING

A. Clean tile and grout surfaces.

3.06 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

3.07 SCHEDULE

A. Shower Floor:

1. Tile: Ceramic Tile.

END OF SECTION

SECTION 09 5100

SUSPENDED ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 REFERENCE STANDARDS

A. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2013a.

B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.

C. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2014.

D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2014.

E. UL (FRD) - Fire Resistance Directory; current edition.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate grid layout and related dimensioning.

C. Product Data: Provide data on suspension system components and acoustical units.

D. Samples: Submit two samples 4 by 4 inch in size illustrating material and finish of acoustical units.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.05 QUALITY ASSURANCE

A. Fire-Resistive Assemblies: Complete assembly listed and classified by UL (FRD) for the fire resistance indicated.

B. Coordination of Work: Coordinate layout and installation of acoustical ceiling units and suspension system components with other work supported by or penetrating through, ceilings, including light fixtures, HVAC equipment, fire supression system components and wall partitions.

C. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:

1. Armstrong World Industries, Inc: www.armstrong.com.

2. Acoustic Ceiling Products, Inc: www.acpideas.com.

3. USG: www.usg.com.

4. Substitutions: See Section 01 6000 - Product Requirements.

B. Suspension Systems:

1. Same as for acoustical units.

2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.

1. Units for Installation in Fire-Rated Suspension System: Listed and classified for the fire-resistive assembly as part of suspension system.

B. Acoustical Tile Type ____: Painted mineral fiber, ASTM E1264 Type III, with the following characteristics:

1. Size: 24 by 24 inches.

2. Thickness: 5/8 inches.

3. Edge: Square.

4. Surface Color: White.

5. Surface Pattern: Non-directional fissured.

2.03 SUSPENSION SYSTEM(S)

A. Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.

B. Exposed Steel Suspension System Type ____: Formed steel, commercial quality cold rolled; heavy-duty.

1. Profile: Tee; 15/16 inch wide face.

2. Construction: Single web.

3. Finish: White painted.

2.04 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Perimeter Moldings: Same material and finish as grid.

1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.

C. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - SUSPENSION SYSTEM

A. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

B. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

C. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

D. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

E. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

F. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

G. Do not eccentrically load system or induce rotation of runners.

H. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.

1. Use longest practical lengths.

2. Overlap and rivet corners.

3.03 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install units after above-ceiling work is complete.

E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

F. Cutting Acoustical Units:

1. Make field cut edges of same profile as factory edges.

G. Install hold-down clips on each panel to retain panels tight to grid system; comply with fire rating requirements.

3.04 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 09 6500

RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

C. Installation accessories.

1.02 REFERENCE STANDARDS

A. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2004 (Reapproved 2014).

B. ASTM F1861 - Standard Specification for Resilient Wall Base; 2008 (Reapproved 2012).

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Verification Samples: Submit two samples, 2 by 2 inch in size illustrating color and pattern for each resilient flooring product specified. If basis of design colors discontinued, or if manufacturer other than basis of design chosen, submit manufacturer's complete set of color samples for Architect's selection.

PART 2 PRODUCTS

2.01 TILE FLOORING

A. Vinyl Composition Tile: Homogeneous, with color extending throughout thickness.

1. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.

2. Size: 12 by 12 inch.

3. Thickness: 0.125 inch.

4. Manufacturers:

a. Armstrong World Industries, Inc: www.armstrong.com.

b. Johnsonite, a Tarkett Company: www.johnsonite.com.

c. Mannington Mills, Inc; _____: www.manningtoncommercial.com. BASIS OF DESIGN.

d. Substitutions: See Section 01 6000 - Product Requirements.

5. Colors:

a. VCT-1: Mannington Commercial: Progressions, 55127 Warm Beige

b. VCT-2: Mannington Commercial: Progressions, 55535 Sprout

c. VCT-3: Mannington Commercial: Progressions, 55170 Duchess Blue

2.02 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove.

1. Height: 4 inch.

2. Thickness: 0.125 inch thick.

3. Finish: Satin.

4. Color: Color as selected from manufacturer's standards.

5. Manufacturers:

a. Burke Flooring: www.burkemercer.com.

b. Johnsonite, a Tarkett Company: www.johnsonite.com.

c. Roppe Corp: www.roppe.com. BASIS OF DESIGN.

d. Substitutions: See Section 01 6000 - Product Requirements.

6. Color: Roppe, 116 Moss.

2.03 ACCESSORIES

A. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

1. Solvent-free, VOC levels shall not exceed 50g/liter.

B. Moldings, Transition and Edge Strips: Same material as flooring.

C. Filler for Coved Base: Plastic.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

3.02 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Fit joints and butt seams tightly.

E. Set flooring in place, press with heavy roller to attain full adhesion.

F. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.03 TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

3.04 RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Install base on solid backing. Bond tightly to wall and floor surfaces.

3.05 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

END OF SECTION

SECTION 09 9000

PAINTING AND COATING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints, stains, varnishes, and other coatings.

C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:

D. Do Not Paint or Finish the Following Items:

1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.

2. Items indicated to receive other finishes.

3. Items indicated to remain unfinished.

4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.

5. Floors, unless specifically so indicated.

6. Glass.

7. Concealed pipes, ducts, and conduits.

1.02 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2014.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of all products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").

2. MPI product number (e.g. MPI #47).

3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

1.04 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

D. Extra Materials: Supply 1 gallan of each color; store where directed. Label each container with color in addition to manufacturer's label.

1.06 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

D. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions.

B. Paints:

1. Base Manufacturer: Sherwin-Williams Company: www.sherwin-williams.com..

2. Duron, Inc: www.duron.com.

3. Glidden Professional, a product of PPG Architectural Coatings: www.gliddenprofessional.com.

4. Benjamin Moore & Co: www.benjaminmoore.com.

5. PPG Paints: www.ppgpaints.com.

C. Transparent Finishes:

1. Base Manufacturer: Sherwin-Williams Company: www.sherwin-williams.com..

2. Behr Process Corporation: www.behr.com.

3. Glidden Professional, a product of PPG Architectural Coatings: www.gliddenprofessional.com.

D. Block Fillers: Same manufacturer as top coats.

E. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PAINTS AND COATINGS - GENERAL

A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.

1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.

2. Supply each coating material in quantity required to complete entire project's work from a single production run.

3. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

B. Primers: As follows unless other primer is required or recommended by manufacturer of top coats; where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Volatile Organic Compound (VOC) Content:

1. Provide coatings that comply with the most stringent requirements specified in the following:

a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.

b. Ozone Transport Commission (OTC) Model Rule, Architectural, Industrial, and Maintenance Coatings; www.otcair.org; specifically:

1) Opaque, Flat: 50 g/L, maximum.

2) Opaque, Nonflat: 150 g/L, maximum.

3) Opaque, High Gloss: 250 g/L, maximum.

4) Varnishes: 350 g/L, maximum.

5) Block filler: 50 g/L, maximum.

6) Interior Latex Primer: 50 g/L, maximum.

2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

2.03 PAINT SYSTEMS - EXTERIOR

A. Concrete Masonry Units: - Opaque, Latex System, Filler & 2 Coats:

1. Filler Coat: Acrylic Block Filler-Prime Coat.

2. a. Sherwin-Williams: Heavy Duty Block Filler, B42W46

3. b. PPG: Pitt-Glaze Acrylic Block Filler, 16-90

4. c. Benjamin Moore: CoroTech Acrylic Block Filler, V114

5. Top coat- 100% Acrylic Elastomeric:

6. Color to match Adams Products #110, Natural Grey (Smooth face) and #A404, Carolina Clay (Split face) color samples.

7. a. Sherwin-Williams: SherLastic 100% AcrylicElastomeric, A5W650

8. b. PPG: Perma-Crete Pitt-Flex, 4-110

9. c. Benjamin Moore: Moorlastic 100% Acrylic Elastomeric Low Lustre, 055

B. Paint ME-OP-2L - Ferrous Metals, Primed, Latex, 2 Coat, Bollards (Guard Posts in Safety Yellow), HM doors & frames, & Overhead doors:

1. Prime with rust-inhibitive primer recommended by top coat manufacturer.

2. Semi-gloss: Two coats of latex enamel

3. a. Sherwin-Williams: DTM Acrylic Semi-Gloss, B66-500 Series

4. b. PPG: Pitt-Tech Plus DTM Acrylic Semi-Gloss, 90-1210

5. c. Benjamin Moore: SuperSpec HP DTM Acrylic SG, P29

2.04 PAINT SYSTEMS - INTERIOR

A. Paint WI-TR-VS - Wood, Transparent, Varnish, Stain (Oak window sills):

1. One coat of stain.

2. One coat sealer .

3. Satin: Two coats of varnish.

B. Paint CI-OP-2L - Concrete/Masonry, Opaque, Latex, 2 Coat:

1. One coat Acrylic Block Filler.

2. a. Sherwin-Williams: Heavy Duty Block Filler, B42W46

3. b. PPG: Pitt-Glaze Acrylic Block Filler, 16-90

4. c. Benjamin Moore: CoroTech Acrylic Block Filler, V114

5. Semi-gloss: Two coats of latex enamel

6. a. Sherwin-Williams: Pre-Catalyzed Epoxy Semi-Gloss, K46-150 Series

7. b. PPG: Pitt-Glaze WB1 Pre-Catalyzed Epoxy S-G, 16-510

8. c. Benjamin Moore: Pre-Catalyzed Epoxy Semi-Gloss, V341

9. Color: 4'-0" high wainscoat: Sherwin-Williams SW 6164 Svelte Sage; Walls above: Sherwin-Williams SW 7004 Snowbound (White).

C. Paint MI-OP-2L - Ferrous Metals, Primed, Latex, 2 Coat (All interior HM doors & frames, exposed structural steel columns & beams):

1. Touch-up with latex primer.

2. Semi-gloss: Two coats of latex enamel.

3. a. Sherwin-Williams DTM Acrylic Semi-Gloss, B66-500 Series

4. b. PPG: Pitt-Tech Plus DTM Acrylic Semi-Gloss, 90-1210

5. c. Benjamin Moore: SuperSpec HP DTM Acrylic SG, P29

6. Color: Sherwin-Williams SW 6164 Svelte Sage.

D. Paint GI-OP-3LA - Gypsum Board/Plaster, Latex-Acrylic, 3 Coat (Upper interior gypsum wallboard, exposed electrical conduit and piping):

1. One coat of alkyd primer sealer.

   a. Sherwin-Williams: ProMar 200 Primer, B28W2600

   b. PPG: Pure Performance Primer, 9-900

   c. Benjamin Moore: Natura Latex Primer, 511

2. Semi-gloss: Two coats of latex-acrylic enamel; Walls at the Wash Bay & Tire Storage only..

   a. Sherwin-Williams:Pre-Catalyzed Epoxy Semi-Gloss, K46-150 Series

   b. PPG: Pitt-Glaze WB1 Pre-Catalyzed Epoxy S-G, 16-510

   c. Benjamin Moore: Pre-Catalyzed Epoxy Semi-Gloss, V341

3. Eggshell: Two coats of latex-acrylic enamel; All other walls..

   a. Sherwin-Williams Harmony low VOC

   b. PPG, low VOC

c. Benjamin Moore, low VOC

4. Color: Sherwin-Williams SW 7004 Snowbound (White)

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to coating application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

3.03 APPLICATION

A. Apply products in accordance with manufacturer's instructions.

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance.

D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

E. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finished coatings until completion of project.

B. Touch-up damaged coatings after Final Acceptance.

END OF SECTION

SECTION 10 1400

SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Room and door signs.

B. Building identification signs.

C. Temporary Construction Sign

1.02 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.

1. When room numbers to appear on signs differ from those on the drawings, include the drawing room number on schedule.

2. When content of signs is indicated to be determined later, request such information from NC DOT through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.

3. Submit for approval by NC DOT through Architect prior to fabrication.

D. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

F. Verification Samples: Submit samples showing colors specified.

G. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Package room and door signs in sequential order of installation, labeled by floor or building.

C. Store tape adhesive at normal room temperature.

1.06 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flat Signs:

1. Best Sign Systems, Inc; www.bestsigns.com.

2. Accusign Inc.; www.accusign.biz.

3. AOA Signs Inc.; www.aoasigns.com

4. Substitutions: See Section 01 6000 - Product Requirements.

B. Other Signs:

2.02 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards, NCSBC-2012 Chapter 11, ICC A117.1-2009 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.

1. Sign Type: Flat signs with engraved panel media as specified.

2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.

3. Character Height: 1 inch.

4. Sign Height: 2 inches, unless otherwise indicated.

5. Office Doors: Identify with room numbers to be determined later, not the numbers shown on the drawings; in addition, provide "window" section for replaceable occupant name.

6. Service Rooms: Identify with room names and numbers to be determined later, not those shown on the drawings.

7. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", room numbers to be determined later, and braille.

C. Building Identification Signs:

2.03 SIGN TYPES

A. Flat Signs: Signage media without frame.

1. Edges: Square.

2. Corners: Square.

3. Wall Mounting of One-Sided Signs: Tape adhesive.

B. Color and Font: Unless otherwise indicated:

1. Character Font: Helvetica, Arial, or other sans serif font.

2. Character Case: Upper case only.

3. Background Color: Clear.

4. Character Color: Contrasting color.

2.04 TACTILE SIGNAGE MEDIA

A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:

1. Total Thickness: 1/8 inch.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Locate signs where indicated:

1. Room and Door Signs: Locate on wall at latch side of door with centerline of sign at 48 inches above finished floor.

2. If no location is indicated obtain NC DOT's instructions.

D. Protect from damage until Final Acceptance; repair or replace damage items.

END OF SECTION

TEMPORARY CONSTRUCTION SIGN:

WAGRAM
EQUIPMENT SHOP

NC DEPARTMENT OF TRANSPORTATION

ARCHITECT / STRUCTURAL ENGINEER:

FACILITIES DESIGN, NCDOT
RALEIGH, NC

SITE/CIVIL: **COVINGTON ASSOCIATES GREENSBORO, NC**

P/M/E: **BRITTAIN ENGINEERING, INC. HICKORY, NC**

CONTRACTORS:

GENERAL CONTRACTOR

GRADING SUBCONTRACTOR
PLUMBING SUBCONTRACTOR
HVAC SUBCONTRACTOR
ELECTRICAL SUBCONTRACTOR

5" HIGH COPY

5" HIGH COPY

2" HIGH COPY

1-1/2" HIGH COPY

5" HIGH COPY

2" HIGH COPY

2" HIGH COPY

1-1/2" HIGH COPY

5" HIGH COPY

2" HIGH COPY

HELVETICA MED. STYLE

ALL COPY # SW-6803-

"DANUBE"

4' x 6' x 3/4" EXTERIOR PLYWOOD, PAINTED
White, 30GY 88/014 BACKGROUND W/
2 - 4" x 4" TREATED WOOD POSTS (3' BELOW GRADE),
BOTTOM OF SIGN PANEL 3' ABOVE GRADE.

COLORS: # SW-6803-DANUBE" - COPY,
#SW- 7004-SNOWBOUND" - BACKGROUND

END OF SECTION

SECTION 10 2113.19

PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Solid plastic toilet compartments.

B. Urinal and vestibule screens.

1.02 RELATED REQUIREMENTS

A. Section 10 2800 - Toilet, Bath, and Laundry Accessories.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.

C. Product Data: Provide data on panel construction, hardware, and accessories.

D. Samples: Submit two samples of partition panels, ____by____ inch in size illustrating panel finish, color, and sheen.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Solid Plastic Toilet Compartments:

1. Ampco Products, Inc: www.ampco.com.

2. Metpar Corp: www.metpar.com.

3. Scranton Products (Santana/Comtec/Capital): www.scrantonproducts.com.

4. Substitutions: Section 01 6000 - Product Requirements.

2.02 SOLID PLASTIC TOILET COMPARTMENTS

A. Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286, floor-mounted unbraced.

1. Color: Basis of Design: Scranton Products, color "Blueberry"..

B. Doors:

1. Thickness: 1 inch.

2. Width: 24 inch.

3. Width for Handicapped Use: 36 inch, out-swinging.

4. Height: 55 inch.

C. Panels:

1. Thickness: 1 inch.

2. Height: 55 inch.

D. Pilasters:

1. Thickness: 1 inch.

2. Width: As required to fit space; minimum 3 inch.

E. Screens: Without doors; to match compartments; mounted to wall with two panel brackets.

2.03 ACCESSORIES

A. Pilaster Shoes: Formed chromed steel with polished finish, 3 in high, concealing floor fastenings.

B. Pilaster Brackets: Polished stainless steel.

C. Wall Brackets: Continuous type, polished stainless steel.

D. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.

E. Hardware: Polished stainless steel:

1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.

2. Door Latch: Slide type with exterior emergency access feature.

3. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.

4. Coat hook with rubber bumper; one per compartment, mounted on door.

5. Provide door pull for outswinging doors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify correct spacing of and between plumbing fixtures.

C. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 to 1/2 inch space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.03 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

B. Maximum Variation From Plumb: 1/8 inch.

3.04 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

SECTION 10 2800

TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Accessories for toilet rooms, showers, and utility rooms.

B. Grab bars.

1.02 RELATED REQUIREMENTS

A. Section 10 2113.19 - Plastic Toilet Compartments.

1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015.

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

E. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

F. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2011.

G. ASTM C1036 - Standard Specification for Flat Glass; 2011.

H. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2008 (Reapproved 2013).

I. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2004 (Reapproved 2010).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data sheets on accessories describing size, finish, details of function, and attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: American Specialties, Inc..

B. Toilet Accessories:

1. ASI - American Specialties, Inc; _____: www.americanspecialties.com.

2. Bradley Corporation; _____: www.bradleycorp.com.

3. Bobrick:www.bobrick.com.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

1. Grind welded joints smooth.

2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.

B. Keys: Provide 2 keys for each accessory to NC DOT; master key lockable accessories.

C. Stainless Steel Sheet: ASTM A666, Type 304.

D. Stainless Steel Tubing: ASTM A269/A269M, Type 304 or 316.

E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

F. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

G. Adhesive: Two component epoxy type, waterproof.

H. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

I. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FINISHES

A. Stainless Steel: No. 4 Brushed finish, unless otherwise noted.

B. Chrome/Nickel Plating: ASTM B456, SC 2, satin finish, unless otherwise noted.

C. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.

D. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.

E. Back paint components where contact is made with building finishes to prevent electrolysis.

2.04 TOILET ROOM ACCESSORIES

A. Toilet Paper Dispenser: Double roll, surface mounted bracket type, chrome-plated zinc alloy brackets, spindleless type for tension spring delivery designed to prevent theft of tissue roll.

1. Product: 0264-1 manufactured by American Specialties.

B. Paper Towel Dispenser: Folded paper type, stainless steel, semi-recessed, with viewing slots on sides as refill indicator and tumbler lock.

C. Soap Dispenser: Liquid soap dispenser, wall-mounted, surface, with stainless steel cover and horizontal stainless steel tank and working parts; push type soap valve, check valve, and window gage refill indicator, tumbler lock.

D. Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036.

1. Size: 18"x36".

2. Frame: 0.05 inch angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; No.4 finish.

E. Grab Bars: Stainless steel, nonslip grasping surface finish.

1. Standard Duty Grab Bars:

a. Push/Pull Point Load: 250 pound-force, minimum.

b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.

c. Length and Configuration: As indicated on drawings.

2.05 SHOWER ROOM ACCESSORIES

A. Shower Curtain Rod: Stainless steel tube, 1-1/4 inch outside diameter, 0.04 inch wall thickness, satin-finished, with 2-1/2 inch outside diameter, minimum 0.04 inch thick satin-finished stainless steel flanges, for installation with exposed fasteners.

1. Product: Model 1214 manufactured by American Specialties.

B. Shower Curtain:

1. Size: 60 X 72 inches, hemmed edges.

2. Shower curtain hooks: Chrome-plated or stainless steel spring wire designed for snap closure.

3. Product: 1200-V & 1200- SHU manufactured by American Specialties.

C. Folding Shower Seat: Wall-mounted recessed; welded tubular seat frame, structural support members, hinges and mechanical fasteners of Type 304 stainless steel, L-shaped, right hand seat.

1. Size: ADA Standards compliant.

2. Product: Model 8202 manufactured by American Specialties.

D. Wall-Mounted Soap Dish: Heavy duty, seamless stainless steel, surface-mounted with drain holes, without grab bar, satin finish; with concealed mechanical fastening suitable for substrate and backplate.

E. Towel Shelf with Towel Bar: Stainless steel Type 304, 3/4 inch square tubular bar; rectangular brackets, concealed attachment, satin finish.

1. Length: 12 inches.

2. Projects from wall: 3-1/4 inches

3. Product: Model 7310 manufactured by American Specialties.

F. Rob/Coat Hook: Heavy-duty stainless steel, single-prong, rectangular-shaped bracket and backplate for concealed attachment, satin finish.

2.06 UTILITY ROOM ACCESSORIES

A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.

1. Drying rod: Stainless steel, 1/4 inch diameter.

2. Hooks: 2, 0.06 inch stainless steel rag hooks at shelf front.

3. Mop/broom holders: 3 spring-loaded rubber cam holders at shelf front.

4. Length: Manufacturer's standard length for number of holders/hooks.

5. Product: 1308-3 manufactured by American Specialties.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on the drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As indicated on drawings and according to the North Carolina Accessibility Code, current edition.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 4400

FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.02 REFERENCE STANDARDS

A. NFPA 10 - Standard for Portable Fire Extinguishers; 2013.

B. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide extinguisher operational features.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:

1. Ansul, a Tyco Business; Cleanguard: www.ansul.com.

2. Nystrom, Inc: www.nystrom.com.

3. Pyro-Chem, a Tyco Business: www.pyrochem.com.

B. Fire Extinguisher Cabinets and Accessories:

1. Ansul, a Tyco Business: www.ansul.com.

2. JL Industries, Inc: www.jlindustries.com.

3. Larsen's Manufacturing Co: www.larsensmfg.com.

4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gage.

1. Class: A:B:C type.

2. Finish: Baked enamel, red color.

3. Temperature range: Minus 40 degrees F to ___ degrees F.

2.03 FIRE EXTINGUISHER CABINETS

A. Metal: Formed primed steel sheet; 0.036 inch thick base metal.

B. Cabinet Configuration: Recessed type.

1. Size to accommodate accessories.

C. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinge.

D. Door Glazing: Float glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.

E. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

F. Weld, fill, and grind components smooth.

G. Finish of Cabinet Exterior Trim and Door: No. 4 - Brushed stainless steel.

H. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

A. Cabinet Signage: FIRE EXTINGUISHER in black lettering, vertically on door.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure rigidly in place.

END OF SECTION

SECTION 10 5100

LOCKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal lockers.

1.02 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's published data on locker construction, sizes and accessories.

C. Shop Drawings: Indicate locker plan layout, dimensions, trim, fillers and accessories, installation and anchoring methods; show verified field measurements and locker numbering scheme.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect locker finish and adjacent surfaces from damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Lockers:

1. Art Metal Products; ____: www.artmetalproducts.com.

2. Penco Products, Inc; ____: www.pencoproducts.com.

3. Republic Storage Systems Co; ____: www.republicstorage.com.

4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 LOCKER APPLICATIONS

A. Lockers: Single tier metal lockers, free-standing with matching closed base.

1. Width: 12 inches.

2. Depth: 18 inches.

3. Height: 72 inches.

4. Fittings: Hat shelf, ceiling hook, two wall hooks.

5. Locking: Built-in combination locks.

2.03 METAL LOCKERS

A. Lockers: Factory assembled, made of formed sheet steel, ASTM A653/A653M SS Grade 33/230, with G60/Z180 coating, stretcher leveled; metal edges finished smooth without burrs; baked enamel finished inside and out.

1. Color: To be selected by ArchitectPenco Products "806 Marine Blue".

B. Locker Body: Formed and flanged; with steel stiffener ribs; electric spot welded.

1. Body and Shelves: 24 gage, 0.0239 inch.

C. Frames: Formed channel shape, welded and ground flush, welded to body, resilient gaskets and latching for quiet operation.

1. Door Frame: 16 gage, 0.0598 inch, minimum.

D. Doors: Hollow double pan, sandwich construction, 1-3/16 inch thick; welded construction, channel reinforced top and bottom with intermediate stiffener ribs, grind and finish edges smooth.

1. Door Outer Face: 18 gage, 0.0478 inch, minimum.

2. Door Inner Face: 20 gage, 0.0359 inch, minimum.

3. Form recess for operating handle and locking device.

4. Provide louvers in door face, top and bottom, for ventilation.

E. Hinges: Two for doors under 42 inches high; three for doors over 42 inches high; weld securely to locker body and door.

1. Hinge Thickness: 14 gage, 0.0747 inch.

F. Number Plates: Provide oval shaped brass plates. Form numbers ____ inch high of block font style with ADA designation, in contrasting color.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared bases are in correct position and configuration.

B. Verify bases and embedded anchors are properly sized.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install lockers plumb and square.

C. Place and secure on prepared base.

3.03 CLEANING

A. Clean locker interiors and exterior surfaces.

END OF SECTION

SECTION 10 5613

METAL STORAGE SHELVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal storage shelving.

B. Shelving accessories.

1.02 REFERENCE STANDARDS

A. ANSI MH28.1 - American National Standard for the Design, Testing, Utilization and Application of Industrial Grade Steel Shelving - Specifications; 1997.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Rated uniform shelf loads.

2. Details of shelving assemblies, including reinforcement.

3. Accessories.

C. Test Reports: Provide independent agency test reports documenting compliance with specified structural requirements.

D. Warranty: Submit manufacturer warranty and ensure that forms have been completed in NC DOT's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inspect for dents, scratches, or other damage. Replace damaged units.

B. Store in manufacturer's unopened packaging until ready for installation.

C. Store under cover and elevated above grade.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide one year manufacturer warranty covering defects of manufacturing and workmanship and rust and corrosion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Four Post Shelving:

1. Hallowell, Div. of List Industries, Inc; _____: www.hallowell-list.com.

2. Penco Products, Inc; _____: www.pencoproducts.com.

3. SpaceSaver Corporation; _____: www.spacesaver.com.

2.02 SHELVING - GENERAL

A. See drawings for layout and sizes.

B. Shelving: Provide products tested to comply with ANSI MH28.1 for design criteria, lateral stability, shelf connections, and shelf capacity.

2.03 FOUR POST SHELVING

A. Four Post Shelving: Steel post-and-beam type with sway bracing, shelving brackets, shelving surfaces, and accessories as specified.

1. Unit Width: 24 inches, center to center of posts.

2. Shelf Capacity: Uniform distributed load of 50 psf, minimum.

3. Finish: Baked enamel, medium gloss.

4. Color: Penco Products: "806 Marine Blue"

5. Number of Units: As indicated on drawings.

B. Posts and Beams: Formed sheet members; perforations exposed on face of members are not acceptable.

1. Metal Thickness: 16 gage, 0.0598 inch.

2. Post Shape: Tee intermediate posts, angle end posts forming corners.

3. Post Face Width: 2 inches, maximum.

4. Connecting Hardware: Manufacturer's standard.

C. Bracing: Formed sheet members.

1. Back Sway Bracing: Either strap or panel; at back of each unit.

2. Side Sway Bracing: Either strap or panel; at each side of each unit.

3. Strap Sway Bracing: One strap installed diagonally, 16 gage, 0.0598 inch; welded, riveted, or bolted to uprights.

4. Panel Sway Bracing: Formed sheet metal panels, 20 gage, 0.0359 inch; welded, riveted, or bolted to uprights.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate is level and that clearances are as specified.

B. Do not begin installation until substrates have been properly prepared.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install shelving with shelf surfaces level and vertical supports plumb; adjust feet and bases as required.

C. Out-Of-Square Tolerance - Four Post Shelving: Maximum of 1/8 inch difference in distance between bottom shelf and canopy top, measured along any post in any direction.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Final Acceptance.

END OF SECTION

SECTION 11 3100
RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Kitchen appliances.

1.2 RELATED REQUIREMENTS
- A. Section 26 2717 - Equipment Wiring: Electrical connections for appliances.

1.3 REFERENCE STANDARDS
- A. UL (EAUED) - Electrical Appliance and Utilization Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.4 SUBMITTALS
- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.
- C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in NC DOT's name and registered with manufacturer.

1.5 QUALITY ASSURANCE
- A. Electric Appliances: Listed and labeled by UL and complying with NEMA standards.

1.6 WARRANTY
- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1 KITCHEN APPLIANCES
- A. Cooking Exhaust: Range hood.
  1. Size: 30 inches wide.
  2. Fan: Two-speed, 500 cfm
  3. Exhaust: Rectangular, recirculated.
  4. Features: Include cooktop light and removable grease filter.
  5. Exterior Finish: Painted steel, color as chosen by Architect and coordinated with Owner furnished appliances..
  6. Manufacturers:
     a. Frigidaire Home Products: www.frigidaire.com.
     b. GE Appliances: www.geappliances.com.
     c. Whirlpool Corp: www.whirlpool.com.
     d. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.1 INSTALLATION
- A. Install in accordance with manufacturer's instructions.
- B. Anchor built-in equipment in place.

3.2 CLEANING
- A. Remove packing materials from equipment and properly discard.
- B. Wash and clean equipment.

END OF SECTION

SECTION 12 1800

AUTO BAY CURTAIN

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Auto Bay Curtain for Wash Bay and Tire Change Bay separation.
- B. Operating track hardware and support structure.

1.02 SUBMITTALS
- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating physical and dimensional characteristics.
- C. Samples: Submit two samples, 4 inch long illustrating materials and finish, color, cord type and color.

1.03 QUALITY ASSURANCE
- A. Comply with NFPA-701 Tests for Fire Resistance.
- B. Verify that materials are water repellent, mildew and rot ressistant, resistant to chemicals, withstands temperature of 180 degrees, and has a cold crack resistance to –40 degrees.

PART 2 PRODUCTS

2.01 MANUFACTURERS
- A. Auto Bay Curtain:
  1. Goff's Enterprises, Inc.; goffscurtainwalls.com; 800-234-0337.
  2. ALECO, Safe/Vue; 256-248-2402.
  3. Wilson Industries, Inc.; wilsonindustries.com; 800-423-4277.
  4. Substitutions: See Section 01600 - Product Requirements.

2.02 BLINDS AND BLIND COMPONENTS
- A. Curtain: Reinforced 14 oz. vinyl curtain hung from curtain track or headrail, with threaded rod track support, utility mounting rack suspended from the roof purlins with threaded rod hanger; manual control of sliding curtain with reinforced edge.
  1. Solid Vinyl Bottom Section: 4'-0" high, with chain weight and grommets and elastic cords.
     a. Color: Teal.
  2. Clear Vinyl Upper Section: 15'-6" high, 20 mils thick with vent flaps that open with wind blowing.
  3. Vinyl Upper Section: 6" high, with brass grommets.
- B. Track and Accessories: Pre-finished and/or non-corrosive finish; internally fitted with hardware, pulleys, and bearings for manual operation with nylon roller hooks.
  1. Color: Natural anodized aluminum, clear finish.
- C. Accessory Hardware: Type recommended by curtain manufacturer.

2.03 FABRICATION
- A. Fabricate curtain to fit within the Bay opening width of +28', with uniform edge and wall clearance and an overlap with of 24" at both sides.

PART 3 EXECUTION

3.01 EXAMINATION
- A. Ensure structural blocking and supports are correctly placed.

3.02 INSTALLATION

A. Install curtain in accordance with manufacturer's instructions. Secure in place with concealed fasteners where possible, provide elastic cords and anchor to side walls and floor to hold curtain from blowing.

3.03 ADJUSTING

A. Adjust curtain for smooth operation.

3.04 CLEANING

A. Clean curtain surfaces just prior to occupancy.

END OF SECTION

SECTION 12 2116

VERTICAL LOUVER BLINDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vertical louver blinds at all windows.

B. Operating hardware.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.03 REFERENCE STANDARDS

A. WCMA A100.1 - Safety of Corded Window Covering Products; Current Edition, Including All Revisions.

B. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2015.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.

2. Storage and handling requirements and recommendations.

3. Installation methods.

C. Certification: Provide certification that product complies with WCMA A100.1.

D. Shop Drawings: Indicate headrail location and schematic wire diagram of electronic controls and motors.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Vertical Louver Blinds:

1. Hunter Douglas; _____: www.hunterdouglas.com.

2. Levolor Contract; _____: www.levolorcontract.com.

3. Graber, division of Springs Window Fashions; _____: www.graberblinds.com.

4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 BLINDS AND BLIND COMPONENTS

A. Vertical Louver Blinds: Horizontal travel, vertical vane louver units complete with tracks, pivot and traversing mechanisms, and accessories, as follows:

1. Vanes: PVC vanes of the size indicated.

2. Operation: Manual.

3. Direction of Travel: As indicated on the drawings.

4. Mounting: Inside (between jambs).

5. Cord and Chain Operation: Comply with WCMA A100.1.

B. Tracks: Channel tracks as required for type of operation, extruded aluminum with clear anodized finish, with end caps.

1. Vane Rotation: Chain driven direct rotation by activating tilt gear within end cap assembly in turn actuating tilt rod and worm-and-spur gears in carrier trucks.

2. Operating Components: Internally mounted heavy-duty extruded aluminum tilt rod, vane carriers, and other components required for proper performance and designed for smooth, quiet, trouble free operation.

3. Pivot Mechanism: Geared for synchronous 180 degrees rotation of vanes and type of operation indicated.

4. Vane Carriers: Metal carriers with ball-bearing wheels or thermoplastic trucks, equipped with linkages or other devices to ensure positive spacing of vanes.

5. Tilt Chain: Nickel plated brass beaded ball chain, minimum 1/8 inch diameter; locate at drawback side of units as indicated.

C. PVC Vanes: Integrally colored, extruded PVC; flat, 2 inches (50mm) wide.

1. Flammability: Comply with NFPA 701.

2. Texture: Smooth.

D. Brackets and Mounting Hardware: As recommended by manufacturer for the mounting configuration and span indicated; provide manufacturer's standard L- bracket with clip for outside mounting and clip only for inside mounting.

2.03 FABRICATION

A. Field measure finished openings prior to ordering or fabrication.

B. Fabricate blinds to fit openings within specified tolerances.

1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch space between bottom of vanes and finish floor.

2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb.

C. Dimensional Tolerances: Fabricate blinds to within plus/minus 1/8 inch of intended dimensions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not start installation before openings are finished and all finishes have been completed; do not install until painting is completed.

B. Field measure finished openings prior to ordering or fabrication.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions using mounting style as indicated.

B. Installation Tolerances:

1. Maximum Offset From Level: 1/16 inch.

C. Adjust blinds for smooth operation.

D. Replace blinds that exceed specified dimensional tolerances at no extra cost to NC DOT.

3.03 CLEANING

A. Clean installed work to like-new condition.

END OF SECTION

SECTION 13 3419

METAL BUILDING SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufacturer-engineered, shop-fabricated structural steel building frame.

B. InsulatedMetal wall and roof panels including soffits and gutters and downspouts.

C. Insulated Metal wall and roof panels including soffits, gutters and downspouts for the Equipment Shop.

D. Exterior louvers and standard wall and roof insulation.

1.02 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications.

B. Section 07 9005 - Joint Sealers. Sealing joints between accessory components and wall system.

C. Section 08 1113 - Hollow Metal Doors and Frames.

D. Section 08 3613 - Sectional Doors.

E. Section 08 5113 - Aluminum Windows.

1.03 REFERENCE STANDARDS

A. AISC 360 - Specification for Structural Steel Buildings; 2010.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014.

E. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2014.

F. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric); 2014.

G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

H. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.

I. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality; 2014.

J. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2015.

K. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

L. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2011 (Reapproved 2015).

M. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014.

N. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

O. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

P. MBMA (MBSM) - Metal Building Systems Manual; Metal Building Manufacturers Association; 2012.

Q. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

R. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies; Current Edition, Including All Revisions.

1.04 DESIGN REQUIREMENTS

A. Design Criteria: Design building structure and enclosure to withstand the following loads and environmental conditions in combinations that produce the maximum stresses in each member or component as prescribed by “Design Standards” listed herein.

1. Basic wind speed: 100 mph.

2. Roof system shall meet the UL Class 90 wind uplift rating, the roof support structure and its fasteners must be designed, and installed to withstand the current NC Code required (ASCE 7-05) zoned wind uplift loads for components and cladding.

B. Design Standards: Comply with applicable requirements of:

1. AISC “Specification for Structural Steel Buildings-Allowable Stress Design and Plastic Design.”

2. AISI “Specifications for the Design of Cold-Formed Steel Structural Members.”

3. MBMA “Low Rise Building Systems Manual.”

C. The current edition of the NC State Building Code, 2012.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's specifications on all building components.

C. Foundation Data:

1. Structural Data: Foundation reaction data indicating compression, tension, moment and shear reactions at each point of connection between foundation and structural steel.

2. Anchor bolts: Setting drawings and templates for location and spacing of anchor bolts.

D. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections; wall and roof system dimensions, panel layout, general construction details, anchorages and method of anchorage, installation; framing anchor bolt settings, sizes, and locations from datum, foundation loads; indicate welded connections with AWS A2.4 welding symbols; indicate net weld lengths; signed and sealed by a professional engineer licensed in North Carolina, certifying that the design complies with the above design criteria.

E. Samples:

1. Verification samples: Minimum 8- by 10-inch samples of finishes on actual substrate materials for the following items:

a. Roofing and Wall panels.

b. Windows.

F. Certification: Written statement signed and sealed by a professional engineer licensed in the state in which the project is located, certifying that the design complies with indicated design criteria and requirements of governing authorities.

G. Guarantee: Written guarantee as indicated in Article 42 of the Supplementary Instruction to Bidders and General Conditions of the Contract (20-year panel finish warranty and the roofing system shall have a 10-year manufacturer's warranty against leakage, and defects, etc.).

1.06 QUALITY ASSURANCE

A. Design structural components, develop shop drawings, and perform shop and site work under direct supervision of a Professional Structural Engineer experienced in design of this Work.

1. Design Engineer Qualifications: Licensed in North Carolina.

2. Conform to applicable code for submission of design calculations as required for acquiring permits.

B. Perform work in accordance with AISC 360, MBMA (MBSM), and AISI Cold-Formed Steel Design Manual.

C. Perform welding in accordance with AWS D1.1/D1.1M.

D. Manufacturer Qualifications: Company specializing in the manufacture of products similar to those required for this project.

1. Not less than 3 years of documented experience

E. Erector Qualifications: Company specializing in performing the work of this section with minimum 5 years experience.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. The Contractor shall warrant the materials and workmanship of the roofing system against leakage and against defects due to faulty materials, workmanship, and contractor negligence within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturinr, cracking, or puncturing.

b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two (2) years from date of Final Acceptance.

C. Provide 20 years manufacturer warranty for roof leak/weathertightness warranty.

1. Manufacturer's weathertightness warranty in Manufacturer's standard form in which Manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

2. The minimum monetary limit on expenditures required to repair the roofing system shall be the Owner's original cost of materials and installation.

3. Warranty Period: 20 years from Date of Final Acceptance.

D. Special Warranty on Panel Finishes: Manufacturer's standard form in which Manufacturer agrees to repair finish or replace meal panels that show evidence of deterioration of factory applied finishes within specified warranty period.

1. Include coverage for exterior pre-finished surfaces to cover pre-finished color coat against chipping, cracking or crazing, blistering, peeling, chalking, fading, or failure of paint to adhere to bare metal.

2.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Buildings:

1. Butler Manufacturing Company: a Blue Scope Steel Company; www.butlermfg.com.

2. Ceco Building Systems: Division of NCI Building Systems, www.cecobuildings.com.

3. Kirby Building Systems: www.kirbybuildingsystems.com.

4. Nucor Building Systems: www.nucorbuildingsystems.com.

5. American Buildings Company, Division of Magnatrax Corp: www.vp.com.

2.02 METAL BUILDING

A. Single span rigid frame with tapered columns.

B. Bay Spacing: 21 ft 4 is typical, unless otherwise noted.

C. Primary Framing: Rigid frame of rafter beams and columns, canopy beams, intermediate columns, and end wall columns, and wind bracing.

D. Secondary Framing: Purlins, and other items detailed.

E. Wall System: Preformed metal panels of vertical profile, with sub-girt framing/anchorage assembly and insulation, and accessory components.

F. Roof System: Preformed metal panels oriented parallel to slope, with sub-girt framing/anchorage assembly, insulation, and liner panels, and accessory components.

G. Roof Slope: 1 inches in 12 inches.

H. End wall framing shall be non-expandable.

2.03 MATERIALS - FRAMING

A. Structural Steel Members: ASTM A36/A36M.

B. Structural Tubing: ASTM A500/A500M, Grade B cold-formed.

C. Plate or Bar Stock: ASTM A529/A529M, Grade 50.

D. Anchor Bolts: ASTM A307, galvanized to ASTM A153/A153M.

E. Bolts, Nuts, and Washers: ASTM A325 or ASTM A325M, Type 1, galvanized to ASTM A153/A153M, Class C.

F. Welding Materials: Type required for materials being welded.

G. Primer: SSPC-Paint 20, Red Oxide.

H. Grout: ASTM C1107/C1107M; Non-shrink; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.

1. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch.

2. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch.

2.04 MATERIALS - WALLS AND ROOF

A. Steel Sheet: Hot-dipped galvanized steel sheet minimum 26 ga. for wall panels and minimum 24 ga. for roof panels, ASTM A653/A653M, SS Grade 33/230, with G90/Z275 coating.

B. Insulation and Facing: Standard 3” wall insulation with white vinyl facing (See Section 07213-Pre-Engineered Building Insulation for the roof insulation).

C. Joint Seal Gaskets: Manufacturer's standard type.

D. Fasteners: Manufacturer's standard type, galvanized to comply with requirements of ASTM A153/A153M, finish to match adjacent surfaces when exterior exposed.

E. Sealant: Manufacturer's standard type.

F. Trim, Closure Pieces, Caps, Flashings, Gutters, Downspouts, Rain Water Diverter, Fascias, and Infills: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

2.05 ACCESSORY COMPONENTS

A. Roof insulation: Specified in section 07 2130

B. Doors and Frames: Specified in Section 08 1113.

C. Overhead Doors: Specified in Section 08 3613.

D. Windows: Specified in Section 08 5200.

E. Wall Louvers: Rectangular end wall and clerestory type Z blade design, same finish as adjacent material, with steel mesh bird screen and frame, blank sheet metal at unused portions.

2.06 FABRICATION - FRAMING

A. Fabricate members in accordance with AISC 360 for plate, bar, tube, or rolled structural shapes.

B. Anchor Bolts: Formed with bent shank, assembled with template for casting into concrete.

C. Provide wall opening framing for doors, windows, and other accessory components.

2.07 FABRICATION - WALL AND ROOF PANELS

A. Siding: Minimum 1-1/4 inch metal thickness, 26 ga. min.,Panel Rib profile indicated, 36 inch wide with intermediate ribs at 12 in o.c., male/female edges fitted with continuous gaskets.

B. Roofing: Minimum 3 inch metal thickness, 24 ga. min.rolled standing seam profile (SSR) profile, 24 in. wide, male/female edges fitted with continuous gaskets. Insulation blocks at purlins with roof insulation.

C. Soffit Panels: Flush soffit panels, unperforated.

D. Girts/Purlins: Rolled formed structural shape to receive siding, roofing and liner sheet.

E. Internal and External Corners: Same material thickness and finish as adjacent material, profile brake formed to required angles. Back brace mitered internal corners with 3 inch thick sheet.

F. Expansion Joints: Same material and finish as adjacent material where exposed, ____ inch thick, manufacturer's standard brake formed type, of profile to suit system.

G. Flashings, Closure Pieces, Fascia: Same material and finish as adjacent material, profile to suit system.

H. Fasteners: To maintain load requirements and weather tight installation, same finish as cladding, non-corrosive type.

I. Snow Guard: Provide Snow Guard at each roof panel lower edge equal to the Original Snow-Gem, 3M adhesive, 888-SNO-GEMS, or equal to roof panel mfr's standard (VP Buildings or Butler Manufacturing Co.).

2.08 FABRICATION - GUTTERS AND DOWNSPOUTS

A. Fabricate of same material and finish as roofing metal.

B. Form gutters and downspouts and scuppers of _____ profile and size indicated to collect and remove water. Fabricate with connection pieces.

C. Form sections in maximum possible lengths. Hem exposed edges. Allow for expansion at joints.

D. Fabricate support straps of same material and finish as roofing metal, color as selected.

2.09 FINISHES

A. Framing Members: Clean, prepare, and shop prime. Do not prime surfaces to be field welded.

B. Exterior Surfaces of Wall, Fascia, and Soffit Components and Accessories: Precoated enamel on steel of Kynar finish, ["Cool Cobalt Blue" color, V-P Buildings Division, including all Roof surfaces].

PART 3 EXECUTION

3.01 EXAMINATION

3.02 ERECTION - FRAMING

A. Erect framing in accordance with AISC 360.

B. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing. Locate braced bays as indicated.

C. Set column base plates with non-shrink grout to achieve full plate bearing.

D. Do not field cut or alter structural members without approval.

E. After erection, prime welds, abrasions, and surfaces not shop primed.

3.03 ERECTION - WALL AND ROOF PANELS

A. Install in accordance with manufacturer's instructions.

B. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.

C. Fasten cladding system to structural supports, aligned level and plumb.

D. Locate end laps over supports. End laps minimum 2 inches. Place side laps over bearing.

E. Provide expansion joints where indicated.

F. Use concealed fasteners.

G. Install sealant and gaskets, providing weather tight installation.

3.04 ERECTION - GUTTERS AND DOWNSPOUTS

A. Rigidly support and secure components. Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts.

B. Slope gutters minimum 1/16 inch/ft.

3.05 INSTALLATION - ACCESSORY COMPONENTS IN WALL SYSTEM

A. Install door frames, doors, overhead doors, and windows and glass in accordance with manufacturer's instructions.

3.06 TOLERANCES

A. Framing Members: 1/4 inch from level; 1/8 inch from plumb.

B. Siding and Roofing: 1/8 inch from true position.

END OF SECTION

SECTION 14 4600

BRIDGE CRANE

PART 1: GENERAL

1.1 SCOPE:
A. Related Work Specified Elsewhere:
1. Structural Steel Framing Section 05 1200)
2. Electrical: Division 26, Electrical
B. Work Included In this Section: Furnish and install Bridge Crane, crane rails and standard controls as specified herein with all incidental components required for the system to be ready for use. Electrical trade shall have final power connection only.

1.2 STANDARDS:
A. Comply with CMAA 74 single girder cranes Class C and all applicable requirements of ANSI B-30.17 and OSHA Par. 1910.179.

1.3 SUBMITTALS:
A. Submit manufacturer's comprehensive product data for all equipment. Provide installation, operation and maintenance instructions along with manufacturer's parts breakdown, product warranty, and address and telephone number of the nearest service representative.

1.4 MANUFACTURER:
A. Subject to compliance with requirements and equal to Mid-Atlantic Crane & Equipment Co.*, (919) 790-3535.
1. Approved equals by De Shazo Crane Co., Duff-Morton, Co., Shaw Box, Detroit Hoist, and Yale Industries Products will be acceptable.

PART 2 PRODUCTS

2.01 MATERIALS

A. Bridge Crane: Quality standard for this installation shall be Mid-Atlantic Crane & Equipment Co.* 3 ton single girder top running crane with span of 72' rail to rail center line. Three ton hoist with a bridge speed of 80 feet per minute with inverter control, with a hoist speed of 15/5 fpm (two speed) and a trolley speed of 50 fpm with inverter control.

B. Beam: Bridge beam shall be designed in accordance with latest specifications of the Crane Manufacturers Association of America and shall be of standard structural shapes, constructed in accordance with AISC specifications. Under full load the beam deflection shall not exceed 1/800 of the span. Bridge beam shall be selected structural steel members and shall provide level and straight tread surfaces for the hoist trolleys. The bridge beam shall be braced and welded to maintain squareness with trucks. Bridge beam shall have adequate lateral stiffness with minimum lateral moment of inertia of 1/20 that of the vertical moment of inertia. Provide tapered top ends of bridge beam as indicated.

C. End Trucks: The end truck frame shall be welded from structural shapes into a single unit as to prevent distortion and mismatch of gears under maximum rated loads. End truck wheel base shall be a minimum of 1/8 of crane span. One wheel in each truck shall be rotating axial direct drive. The truck shall contain diaphram members welded to truck frames to maintain alignment and distribute truck loads uniformly on inner and outer truck members. The truck shall be designed so that the drop of the truck will be limited to one inch in case of axle or wheel failure. Attachment of end truck to bridge beam shall be by welding to insure alignment

D. Crane Wheels: Crane wheels shall be double-flange alloy steel and have tread surfaces hardened to 375 to 425 Brinell. Each wheel shall be supported on tapered roller bearings mounted on stationary axles suitable to take radial and thrust loads. The wheels shall be lubricated at the factory with sodium-based grease and provided with a suitable reservoir of lubricant to eliminate the need for field lubrication. Wheel axles must have mounting nuts for bearing adjustment. Wheel mounting shall be designed so that axles and wheels can be removed without disturbing other truck elements of their alignment. Wheel treads shall be smooth, true and uniform within .010 inch tread diameter on all wheels.

E. Runways: Crane ASCE rails, and stops shall be furnished to the General Contractor as instructed and coordinated with the information provided by the crane manufacturer. Runway rails shall be straight, parallel, level, and at the same elevation. The distance center to center and the elevation shall be within a tolerance of plus or minus 1/8". The runway rails should be standard rail sections of a proper size for the crane to be installed and must be provided with proper rail splices. See Section 051200.

F. Crane Drive: Each end truck shall be provided with a helical gear motor reducer. The drive motor for each truck shall be fully enclosed, 30 minute duty rated Class B insulation in a NEMA frame and shall comply with NEMA Performance Specifications. A spring set, electrically released AC disk type brake shall be integrally mounted on each reducer in line with the motor. The motors shall be integral with fully enclosed oil splash lubricated gear reducers, 2-speed motor. The gear reduction shaft shall be supported by precision ball or roller bearings.

G. Bearing Life: All bearings in the crane wheels and the gear reduction shafts shall be designed for 5,000 hours B-10 bearing life minimum.

H. Bridge Bumpers: The bridge shall be provided with bumpers capable of stopping the crane, not including the live load, at a rate of deceleration not to exceed three feet per second when traveling in either direction at 20% of rated speed. The bumpers shall have sufficient energy absorbing capacity to stop the crane when traveling at a speed of at least 40% of the rated load speed.

I. Rail Sweeps: Bridge trucks shall be equipped with sweeps which extend below the top of the rail and project in front of the crane wheels.

J. Electrical Controls: Electrical controls shall use a voltage of 110 V, 60 H, 1- ph. Bridge control shall include a main line Contractor, manually operated fused main line disconnect with lock-out provision, branch circuit fuses, frequency inverter bridge control and transformer with a fused secondary. Bridge control shall be mounted on bridge in NEMA Type 3R enclosure activated from a pendant push button station from a festooned C-track. Crane drive motor (2 @ 1/2 hp) and hoist motor to operate on a supply voltage of 208 V, 3 Phase, 60 Hertz.

K. Bridge Conductors Wiring: Flat wire festoon bridge conductors shall be provided with the crane to provide fully insulated bridge electrification. All other wiring of the crane shall be in rigid or flexible conduit in accordance with National Electrical Code.

L. Rope Hoist: Standard headroom electric wire rope hoist with motorized trolley and two speed hoist motor. Right and left hand grooving for true vertical lift. Controls to be 3 pole magnetic reversing type in a NEMA Types 3R enclosure with momentary contact type buttons. Weston load brake in hoist gear box shall hold fully capacity load independent of motor brake and can hold the load stationary in any position, 208 v, 3 phase, 60 Hz.

M. Painting: All structural parts shall be cleaned of rust and mill scale. The complete crane shall be given the appropriate number of coats of anti-corrosion primer and finish paint to protect surface from environmental damage. Type of paint and color of final coat shall be according to manufacturer's standard.

PART 3: EXECUTION

3.1 INSTALLATION:

A. Comply with manufacture's detailed instructions, and coordinate crane rail erection with crane manufacturers instructions. Install complete system in working order. Provide necessary adjustments required for safe and efficient operation. Load test at 125% of rated capacity using certified weights by OSHA. Certified weights by crane supplier.

END OF SECTION

21 – FIRE PROTECTION

SECTION 21 01 00 – GENERAL PROVISIONS – FIRE PROTECTION

PART 1 - GENERAL CONDITIONS:

Authority Having Jurisdiction (AHJ), Building

The AHJ is the local government entity that approves project plans, issues building permits, and inspects construction. If built on State land, NC State Construction Office review and approval is also required. Per GS 58-31-40, capital projects over 20,000 SF shall be are reviewed at NC State Construction Office in Raleigh.

Reference NFPA Standards

NFPA 13-Sprinkler Systems
NFPA 14-Standpipe and Hose Systems
NFPA 15-Water Spray Fixed Systems
NFPA 16-Foam-Water Sprinkler Systems
NFPA 20-Centrifugal Fire Pumps
NFPA 22-Water Tanks for Private Fire Protection
NFPA 24-Private Fire Service Mains
NFPA 25-Insp., Testing, and Maintenance of Water-Based Fire Protection Sys.
NFPA 72-National Fire Alarm Code

NC Department of Insurance – OSFM
“Fire Sprinkler and Suppression Systems

Plans and Specifications Content

The Plans and Specifications for this project are performance based and provide the following information:

- Water supply test data (since this is an existing sprinkler system and this renovation is for a small portion of the building, no test data is provided. The Contractor shall verify all flows and pressures prior to beginning design along with hydrant locations, hydrants used, their elevation, and elevation of riser base.

- Fire Sprinkler Riser location and details including valves, test connections, drains, etc.

- Reflected ceiling plans for all areas of building.

The above information defines the system's performance and also its major features. Please note that this list of design details does **not** include the size and location of the

sprinkler pipe and heads, nor the hydraulic calculations. These are to be provided by the fire sprinkler system contractor. The contractor's shop drawings will include the size, type, and location of all sprinkler piping and heads, plus hydraulic calculations, completing the system design.

Reviews of Contractor's Shop Drawings and Hydraulic Calculations

1. The specifying engineer (PE), has primary responsibility for review and approval of sprinkler system shop drawings and calculations. Contractor must provide a minimum of 3 copies (more if required by engineer's specification). PE's review shall be to determine "substantial compliance" with this document and the project specification. After completing this review, the Contractor shall provide two (2) marked-up copies to the AHJ (see 1.1) for approval. The Architect shall copy to NC State Construction Office for approval. No work can begin until all approvals have been obtained.

Contractor License, Qualifications, and Responsibilities

The contractor must be licensed by the North Carolina State Board of Examiners of Plumbing, Heating, and Fire Sprinkler Contractors. The contractor may be required to furnish evidence of satisfactory performance on previous sprinkler system installations of equivalent size, type, and complexity.

The automatic sprinkler designer shall have on staff a minimum of one designer with current certifications from the National Institute for Certification of Engineering Technician, Level III, subfield of automatic sprinkler layout, who shall oversee and be responsible for the project and sign off on all drawings submitted by the equipment supplier.
The contractor shall furnish all parts, materials, and labor required for a complete and operating system in accordance with all applicable requirements, even if each needed item is not specifically shown or described in the plans or specs.

The contractor is also responsible for the inevitable adjustments in sprinkler head locations, sprinkler quantity, and piping required for full compliance with the NC Building Code, NFPA standards, and the project plans and specifications.

Shop drawings shall be submitted for review prior to construction, per (1.4) above, and **must** include the hydraulic calculations. Construction must not start until the necessary review(s) and approval(s). After the project is completed, Contractor’s Material and Test Certificates are to be submitted on the installation, in accordance with NFPA 13. (See 5.3) **NOTE: The sprinkler system riser must not be connected until the sprinkler contractor has verified that the underground piping has been tested, flushed, and certified per NFPA 24 by the responsible underground piping contractor.**

Approval of samples, cut sheets, shop drawings, and other matter submitted by the contractor shall not relieve the contractor's responsibility for full compliance with project

plans and specifications, unless the attention of the specifying engineer is called to each non-complying feature by accompanying letter, and the engineer subsequently gives written authorization for the specific deviation(s).

Engineer's approval (with or without corrections) of contractor's Shop Drawings, samples, cut sheets, etc. is only for general conformance with contract documents and design concept. It does not relieve the sprinkler contractor of responsibility for full compliance with plans and specs except as noted in the preceding paragraph.
If any conflict is observed between this document and the project plans, referenced Codes, or Standards, obtain a ruling from the AHJ before proceeding with purchase of materials, fabrication, or installation of the system. Failure to do so may cause the sprinkler contractor to be held liable for any cost or delay incurred as a result.

INTENT:

Work under this contract comprises the installation of a new automatic fire protection sprinkler system, with accessories and distribution system.

The word "Contractor" as used in this Section of the Specifications refers to the Automatic Fire Protection Sprinkler System Contractor unless specifically otherwise noted. The word "provide" means furnish, fabricate, complete, install, erect including labor and incidental materials as necessary to complete in place ready for operation or use the items referred to or described herein, and as shown or referred to on the Contract Drawings.

PROJECT SPECIFICATIONS AND DRAWINGS:

These specifications and the accompanying drawings shall include the furnishing of all labor, transportation, materials, apparatus, fuel, energy, light, scaffolding and tools necessary to furnish and install in a skilled workmanlike manner a complete dry automatic fire protection sprinkler system and everything properly incidental thereto as shown on plans, stated in specifications or reasonably implied therein, all in accordance with contract documents.

Minor details not usually shown or specified, but necessary for the complete installation and proper operation of an automatic sprinkler system, shall be included in the work scope, as if herein specified or shown in detail.

CONSTRUCTION SCHEDULE AND COORDINATION:

The Sprinkler 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 is defined to include but not limited to miscellaneous steel, supports, hangers, etc., which is required by this Division of the specifications.

BASIC SYSTEM PARAMETERS

Hydraulic Calculations

Sprinkler contractor must verify the water supply by test, using 2 hydrants as close to the point of connection as possible, preferably witnessed or performed by a fire official. Contact water authorities before test, to verify normal system status and to determine typical fluctuations in available pressure/flow at that location due to tank fill, pump status, industrial demand. Base design on NFPA Safety Factor. Calculations start at water main connection under street and must include backflow preventer plus all valves and fittings. Include hose stream allowance specified by NFPA 13 for that hazard, unless AHJ permits a reduced hose allowance for that specific project due to limited water supply. Limit sprinkler system water velocity to 25fps, except use 18fps for any segment with a vane-type water flow switch, to comply with its UL listing.

Minimum Design Density

The hazard for each individual area shall be analyzed prior to determining sprinkler density, using NFPA 13-2007 Chapter 5 and A5.1 - A5.6. Each protected area shall be analyzed independently to determine the greatest hazard present.

The minimum design density is Ordinary Hazard - Group I. If there are open areas greater than 5,000 ft², or if combustible construction is used, the minimum design density shall be modified in accordance with Fire Protection Design Criteria, Sheet FP-3.

Extent of Sprinkler Coverage

Ordinary electrical equipment rooms, telephone closets, and similar spaces shall be fully sprinkled. Sprinkler protection is permitted to be omitted in main electrical switchgear and generator rooms, *provided* they have direct outside access for the fire department and are enclosed by 2-hour fire rated construction.

System Zoning Requirements

Each story must be a separate sprinkler zone with a dedicated cutoff valve, tamper switch, water flow switch, and an Inspector's Test valve piped to a drain capable of handling full flow without backup or splatter. All cutoff and test valves are to be located on the floor they serve, unless the AHJ permits a different arrangement.

Electrical Supervision

Electrical supervision per NFPA 72 is required for monitoring the position of all sprinkler cutoff valves beyond the water source valve, including the outside post indicator valve (PIV) and isolation valves for the backflow prevention device. Tamper switches for

OS&Y valves shall be mounted to rigid frames secured by bolts through clamp bars. ("J"-hook mounting to the valve's frame is not permitted.)

VISIT TO SITE:

It shall be the duty of each prospective Contractor to visit the site and familiarize himself with the existing job conditions. No extra will be allowed because of additional work necessitated, or change in plans required by job conditions unless same is brought to the Engineer's attention before opening of the bids.

The submission of a bona fide bid shall be considered as evidence that the Contractor has inspected the job site and is satisfied with the conditions under which the work of this contract must be fulfilled.

CODES, RULES, PERMITS:

The Sprinkler Contractor shall give all necessary notices, obtain all permits and pay all government sales taxes and other costs including utility connections or extension, in connection with his work; file all necessary plans, prepare all documents and obtain all necessary approvals of all governmental departments having jurisdiction; obtain all required certificates of inspection for his work and deliver three (3) copies of the Local Building Inspection Department, and the Owner's Fire Insurance Underwriter's Certificates of approval to the Engineer before request for acceptance and final payment for the work.

The Sprinkler Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus, drawings, in order to comply with all applicable laws, ordinances, rules and regulations, whether or not specifically shown on the Sprinkler Contract Drawings or specified.

All materials furnished and all work installed shall comply with the National Fire Protection Association Code 13, with the requirements of all Governmental Departments having jurisdiction and with the requirements of the Owner's Fire Insurance Underwriter.

The entire sprinkler system shall be installed in complete accordance with the requirements of the local Fire Marshall. The Contract Drawings and Specifications shall be considered minimum requirements.

Where drawings and specifications exceed the requirements of any code or regulation, the drawings and specifications shall govern. If the contractor observes that the drawings and specifications are at variance with applicable codes, he shall promptly notify the Engineer in writing and any necessary changes shall be negotiated as provided in the contract for changes in the work. If the Sprinkler Contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Engineer, he shall bear all costs of correcting unacceptable

material and/or work.

CONTRACTOR'S QUALIFICATIONS:

It is assumed that the Contractor has had sufficient general knowledge and experience to anticipate the needs for 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 system specified or shown on the plans.

THE AUTOMATIC SPRINKLER DESIGNER SHALL HAVE ON STAFF A MINIMUM OF ONE DESIGNER WITH CURRENT CERTIFICATIONS FROM THE NATIONAL INSTITUTE FOR CERTIFICATION OF ENGINEERING TECHNICIAN, LEVEL III,SUBFIELD OF AUTOMATIC SPRINKLER LAYOUT, WHO SHALL OVERSEE AND BE RESPONSIBLE FOR THE PROJECT AND SIGN OFF ON ALL DRAWINGS SUBMITTED BY THE EQUIPMENTSUPPLIER. (VOLUME 1-A, 87-21 (B) 3)

DESCRIPTION OF WORK:

The Contractor is cautioned to read the entire project specifications and the entire set of project working drawings to assure that no reference to work by the Sprinkler Contractor is overlooked and to assure an understanding of the overall building construction and of the division of work between the various trades and contracts. Failure of the Sprinkler Contractor to do this shall not relieve him of any responsibility or remove any work from the Fire Protection Sprinkler System Contract.

The general arrangement of piping and equipment shall be as shown on the Drawings. The Contractor shall examine carefully all Contract Documents, and shall be responsible for the proper fitting of materials and equipment in each location as indicated, without substantial alteration.

Inasmuch as the Drawings are generally diagrammatic, and because of the small scale of the Drawings, it is not possible to indicate all off-sets, fittings, and accessories which may be required. The Contractor shall investigate carefully the structural work accordingly - furnishing at no additional cost to the Owner such fittings, valves, transitions and accessories as may be required to meet such conditions.

The Fire Protection Sprinkler Contractor shall prepare detailed system layout, water distribution, pipe sizes and installation detail drawings. Six (6) sets of complete prints shall be submitted for approval to the Owner's Fire Insurance Underwriter and meet all State and Local Code Requirements.

The right to make any reasonable change in location of apparatus, equipment, or routing of piping, up to the time of roughing in, without involving any additional expense to the Owner is reserved by the Engineer.

FIELD ADJUSTMENTS AND COORDINATION:

The 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 correctness of same as related to the work.

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 Engineer and shall not proceed with his work until he has received instructions from the Engineer.

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. The Contractor shall first obtain approval from the Engineer and shall pay all cost of design and all additional cost, deriving therefrom, incurred by other contractors on the project.

Where such approved deviation requires a different quantity and arrangement of piping, wiring, conduit and equipment from that specified or indicated on the drawings, the Contractor shall furnish and install any such 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.

MATERIALS AND WORKMANSHIP:

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 Engineer shall be furnished.

The Contractor shall furnish the service 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, adjust, start, operate and test each system.

Unless otherwise specifically indicated on the plans or specifications or as directed by the Engineer, all equipment and materials shall be installed in accordance with the recommendations of the manufacturer. This includes the performance of such test as the manufacturer recommends.

All work must be done by first-class and experienced mechanics properly supervised. It is understood that the Engineer has the right to stop any work that is not being properly executed and has the right to demand that any incompetent workmen be removed from the job and a competent workman substituted therefor.

This Contractor shall bear the cost of all utilities, including installation and removal of temporary connections, required to perform the work under this Contract. Where services such as electricity, hoist, etc, are provided by the General Contractor, this contractor shall negotiate directly with the General Contractor for his portion of the utilities.

FIELD ADJUSTMENT AND COORDINATION:

The 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. The contractor shall coordinate his work 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.

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 sprinkler heads, piping valves, alarms and drain points. Provide access doors as required for access for this purpose. Minor deviations from the Drawings, subject to approval by the Engineer, may be made to allow for better accessibility.

The Contractor shall provide the General Contractor the exact locations of access panels for equipment, concealed valve, or other device requiring service. Locations of these panels shall be submitted in sufficient time to be installed in the normal course of the work.

SEPARATE CONTRACTS:

The Fire Protection Contractor, as part of this Contract, will be responsible for any alarm devices and similar equipment supplied and installed i.e. flow switches and tamper switches. The electrical contractor shall provide wiring, connecting and monitoring these devices. The testing of these devices shall be performed by the Fire Protection Contractor.

SHOP DRAWINGS AND SUBMITTALS:

Shop drawings and other submittal information of items offered as substitutes or equals to that specified shall be submitted for approval within fifteen (15) days after the award of contract.

The Contractor shall within fifteen (15) days after receipt of properly signed contract submit to the Engineer for approval five (5) copies of a list of supplies, manufacturer's material and equipment to be used on this project.

Substitution of materials or equipment for that specified will not be accepted without written approval by the Engineer. The Engineer shall be the sole judge as to whether material or equipment is "equal" to that specified and acceptable for this particular job and application.

The Contractor shall within thirty (30) days of receipt of properly signed contract submit to the Engineer for approval five (5) copies of manufacturer's descriptive literature and specifications on equipment to be installed under this contract. See list below of equipment and materials on which specification data shall be submitted for approval.

Materials and equipment on which descriptive information and specifications are not submitted for approval within the time stated above shall be supplied and installed exactly as specified.

Material and equipment manufacturer's lists and specification data shall be submitted to the Engineer for approval and verification whether materials and equipment to be used are as specified or a proposed substitute.

The Contractor shall check thoroughly all manufacturer's data to satisfy himself that it is correct and complete prior to submittal to the Engineer. The contractor's letter of transmittal shall so state. The material and equipment manufacturer's list shall be complete. Manufacturer's descriptive literature and specification data shall be accumulated by the Contractor. All data required for the project shall be submitted to the Engineer at one time to expedite approval and facilitate overall project coordination.

Approval by the Engineer of specific equipment data shall not relieve the Contractor of the responsibility of supplying the proper quantity, accessory hardware and miscellaneous material required for a complete operating installation as specified.

Two (2) copies of all lists and data submitted will be retained by the Engineer. The Contractor shall increase the number of copies submitted by the number he requires if more than three (3) copies are to be returned to him.

Shop drawings approval shall be obtained by the Authority Having Jurisdiction (AHJ) prior to commencing any field work per GS 58-31-40.

Submittals, drawings, and hydraulic calculations shall bear the **NICET technician's certification number and signature.**

Submit list of manufacturers and source of supply of the following materials:

(1) Fittings.
(2) Valves.
(3) Sprinkler heads.
(4) Hangers.
(5) Steel pipe.

INCIDENTAL CONSTRUCTION WORK:

The Sprinkler Contractor shall supply and shall set sleeves for piping and inserts for hangers as building construction progresses. Install equipment noted to be concealed in walls before walls are constructed in order that walls may be constructed around piping, etc.

The Sprinkler Contractor shall cut chases for his work in existing walls.

Unless otherwise noted, in the new construction work the General Contractor will provide openings and lintels for this Contractor's work as building construction progresses, but this Contractor shall fully designate these requirements prior to building construction at those particular locations.

Failure of this Contractor to furnish his requirements prior to building construction and failure to coordinate his work with other contractors shall make this Contractor responsible for the execution and cost of reinstallation of his work and proper repair of general construction.

Cutting of structural members or cutting of finished work must be approved in writing by the Engineer before cutting. Reinforcing of member at cutting work shall be the responsibility of the Contractor and shall be done in a manner satisfactory to the Engineer.

AS-BUILT DRAWINGS:

The Contractor shall maintain at the job site a set of "clean" contract drawing prints accurately marked to indicate field changes and "as built" conditions. All "as built" deviations from the contract drawings shall be accurately shown on these prints. In the event that the entire contract work was installed as shown on the contract drawings, the Contractor shall so certify on the "as built" prints and deliver to the Engineer.

OBSERVATION:

The project will be observed periodically as construction progresses. The Contractor will be responsible for notifying the Engineer at least 48 hours in advance when any work to be covered is ready for inspection. No work shall be covered until after observation has been completed on such items as piping, etc.

PART 3 - PRODUCTS

MATERIALS AND INSTALLATION:

All sprinkler system materials and components must be listed or approved, and installed in strict conformance to the conditions of their listing / approval.

Sprinkler Piping

Metal: Only steel pipe shall be used, with a Corrosion Resistance Ratio (CRR) of one (1) or greater. Schedule 5 pipe is ***not*** permitted, in any size. Schedule 10 steel pipe and the approximately equal "flow" products, sizes 1.5" and larger, are permitted to be used **only** with listed roll groove end fittings. All dry pipe, deluge, and preaction system pipe must be galvanized, including any fittings exposed to weather. Listed flexible stainless steel piping systems (e.g. FlexHead, Flex-Arm) are also permitted.

Fittings and Joints

All fittings must be listed or approved for the specific pipe and type of system they are used on. For gasketed fittings, install only with the lubricant the manufacturer obtained listing with, since other lubricants may not provide suitable performance.

Metal: The following joining methods are acceptable for steel pipe, to the extent permitted by listings, except that threading or cut groove fittings are accepted for use only on fully complying Schedule 40 and heavier pipe:

- Threading
- Shop Welding
- Cut Groove with Gasket Fitting
- Roll Groove with Gasket Fitting
- Full Back Design Clamp-on Fittings
- "U" Bolt Design Clamp-on Fittings (Only for pipe of 2.5" run size and smaller)

Plain end, hooker, press-on, key-type or slip-type metal fittings are ***not*** permitted.
All grooved metal products on a job (both fittings and couplings) must be products of the same manufacturer.

PIPE SUPPORTS:

This Contractor's attention is directed to the General Construction and Structural Steel Drawings for this project. This Contractor shall provide all miscellaneous steel, bridging

and brackets necessary to properly support sprinkler system's piping. All such steel, hangers and attachments shall be mounted to the building structural steel frame or walls. No attachment of any kind shall be made to the roof deck.

Hanger numbers of Grinnell are used herein. Hangers by C & P, Crawford or Modern are acceptable subject to verification approval. Support pipes neatly and securely by hangers with maximum spacing as follows: Up to size 1" pipe, 6'-10" (maximum) centers; 1-1/4" pipe and larger, 8'-0" (maximum) centers, unless otherwise noted. Use two hangers at each turn in direction. Support piping from building overhead construction. Use adjustable split ring solid rod type hangers Fig. 260 or Fig. 269. Bolt, clamp, power drive or weld rods to building construction. Support pipe risers along wall from wall with Fig. 139 supports.

Provide steel supports between joists, anchors, frames, bracing, plates, bolts, nuts, washers, etc., incidental to installation of work. Provide bracing for all vertical risers. Arrangement subject to approval. Deliver steel to job site with prime coat of paint.

PIPE SLEEVES:

This Contractor shall furnish and the General Contractor shall install black steel sleeves where piping passes through a building wall, floor, ceiling or partition. Sleeves shall be placed during construction of building and shall be of size to allow for expansion and contraction movement of the piping.

Sleeves in floors in finished areas shall project 1/2 inch above finished floor. All sleeves shall be firmly and neatly set in place, concentric with horizontal or vertical pipe encased.

Sleeves in ceiling shall finish flush. Wall sleeves in finished areas shall project 1/4 inch.

Sleeves for piping passing through walls or footings shall be set during the general construction to preclude cutting or damaging the general construction work. Cutting and patching of footings after general construction will <u>not</u> be permitted.

ESCUTCHEON PLATES:

Furnish and install solid cast iron unplated escutcheons on all piping passing through or into walls, floors, ceilings and partitions in finished areas. Escutcheons on piping at walls, ceilings and partitions shall be Grinnell #395, or equal. Escutcheons on piping at floors shall be Grinnell #396, or equal. All escutcheons shall have screws which finish flush with outside plate surface. Anchor escutcheons to building construction or pipe according to manufacturer's recommendations.

Escutcheons shall be installed on hanger rods in finished areas. These escutcheons shall be Grinnell #133.

Where sleeves project above floors, furnish and install cup type escutcheons around pipe and over sleeves.

Sprinkler Heads

- For Classrooms, Offices and general areas, heads shall be Recessed type to match existing as manufactured by Tyco, Reliable or Victaulic.

All sprinkler heads shall be 155 ° F.

PART 4 - EXECUTION

CLEANING UP:

Cleaning up of trash debris and surplus material resulting from this contractor's work is the responsibility of this 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.

Clean from all exposed metal surfaces grease, mortar, debris or other foreign material.

Chrome plated fittings and trim shall be polished upon completion.

COOPERATION WITH OTHER TRADES:

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.

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 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 to the Owner.

This Contractor shall furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of sprinkler work and for the purpose of coordinating adjacent work.

PART 5 - VIBRATION ISOLATION AND SEISMIC RESTRAINT:

Project Information:

Seismic Design Category C.
Seismic Use Group II.
Site Classification D.

Seismic Design Category C does not require any restraints.

PIPE TEST:

Upon completion of the installation of various parts of the sprinkler system, all equipment, apparatus and appurtenances shall be properly adjusted and tested by the Contractor and placed in proper operating condition. The Contractor shall furnish all labor and equipment necessary to properly perform tests. No portions of the work shall be covered or concealed until tests are completed.

Tests shall be made in the presence of the Owner's Underwriter or their duly authorized representative. Tests shall be performed in sections when authorized and shall be performed in this manner when requested by the Engineer.

All water piping shall be tested at the static air pressure of 200 lbs. per square inch for a minimum of twenty (2) hours without loss of pressure in accordance with NFPA 13. This applies to both underground and above ground piping.

The Engineer shall be notified by the Contractor during the normal working day at least 48 hours before any anticipated tests. Inspection shall be requested after the Contractor has assured himself that the work will stand the prescribed tests.

Materials or equipment which prove to be defective as a result of inspection or test shall be replaced within three (3) working days and the inspection or test repeated.

The Fire Protection Contractor shall follow NFPA 13, Chapter 24 “Systems Acceptance” for testing of the sprinkler system including completing all Certificate Forms listed in Chapter 24 for “Aboveground Piping” and NFPA 24 “Underground Piping”.

Testing shall be performed in the presence of the Owner's representative.

Prior to making a request of Beneficial Occupancy the Fire Protection Contractor shall submit written test reports and certificates as required by NFPA 13 and 24. Submittals shall include system acceptance form approved by NFPA only no other forms will be considered.

GUARANTEE:

This Contractor shall guarantee the materials and workmanship installed under this contract against defect due to faulty materials, faulty workmanship or negligence for a period of twelve (12) months following final acceptance of the work by the Owner. Where items of equipment or material carry a manufacturer's warranty for a period in excess of twelve (12) months, the manufacturer's warranty shall apply for that particular piece of equipment or material. The Contractor shall make good such defective materials, equipment or workmanship within the stipulated guarantee period.

This Contractor shall give a letter of guarantee stating the dates the guarantee period begins and ends. Furnish the Engineer with three (3) copies of letter of guarantee.

END OF SECTION

22 80 80 - COMPRESSED AIR SYSTEM COMPONENTS

PART 1 - GENERAL

1.1 Scope:

A. Related Work Specified Elsewhere:
   1. Coordinate work of this Section with General Requirements of Division 1.
   2. Oil supply pumps (Section 22 80 70)
   3. Air piping

PART 2 - PRODUCTS

A. Air compressor to be provided by the Owner. Plumbing contractor is responsible for installation and piping to his equipment.
B. Air compressors to be set on vibration isolator pads to be approved by Owner.
C. Between air compressor and main air line there shall be a braided flex hose. This hose shall be at lease the same size as the main air line and shall be designed to accept at least 200 psi in pressure.
D. Galvanized-Steel Pipe and Fittings
   A. Galvanized-Steel Pipe:
      1. ASTM A 53/A 53M, Standard Weight.
      2. Include ends matching joining method.
   B. Galvanized-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106/A 106M, Standard Weight, seamless steel pipe with threaded ends.
   C. Galvanized, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
   D. Malleable-Iron Unions:
      1. ASME B16.39, Class 150.
      2. Hexagonal-stock body.
      3. Ball-and-socket, metal-to-metal, bronze seating surface.
      4. Threaded ends.
   E. Flanges: ASME B16.1, Class 125, cast iron.

PART 3 - INSTALLATION

A. Installation shall be by skilled workmen and shall be in strict accordance with manufacturer's standards.
B. Guarantee of parts and workmanship for a period of not less than one year.

Labeling: All compressed air piping shall be labeled per 2012 North Carolina Fire Code Section 3003.4.3 and ASME A13.1. Labels shall include content’s name, direction of flow, marked at each valve, at wall floor or ceiling penetration, at each change in direction, and at a minimum of every 20’ or fraction thereof throughout the piping run as required.

END OF SECTION

SECTION 28 31 00 – FIRE ALARM SPRINKLER MONITORING SYSTEM <S> <OM>

FIRE ALARM SYSTEM

PART 1

1.0 SCOPE

This specification provides the requirements for complete Fire Alarm System installation for sprinkler monitoring detection and reporting devices as shown on the drawings. The installation of devices shall include, but not be limited to: automatic activated alarm initiating and indicating peripheral devices and appliances, raceways, boxes, wire and accessories. The Fire Alarm System must be fully operational and certified at the conclusion of this project.

1.1 Summary

1.1.1 General

The work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements.

1.1.2 Summary - Fire

This performance specification provides the minimum requirements for monitoring and reporting of sprinkler water flow and valve tampering. This installation shall include, but not be limited to all equipment, materials, labor, documentation and services necessary to furnish and install additional initiating and notification devices for a complete, operational system to include but not limited to the following functions: Smoke detection and pull station at the Fire Alarm Control Panel and monitoring and reporting the activation of Flow Switch and Tamper Switch.

1.1.3 Manufacturer

This specification is based on any qualified Fire Alarm System manufacturer that provides addressable identification for the initiating devices in the building. Acceptable fire alarm system manufacturers that are approved but not limited to Simplex-Grinnell, Edwards, Gamewell and Notifier.

All equipment and components shall be the manufacturer’s current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protected premises protective signaling (fire alarm) system. Authorized representative of the manufacturer shall be responsible for the satisfactory installation.

The contractor shall provide from the current product lines, equipment and components that comply with the requirements of these specifications.

Equipment or components, which do not provide the performance and features required by these specifications, are not acceptable.

1.1.4 System Equipment

The contractor is required to ensure that the installed and programmed devices will function as designed. All specified operational features must be met without exception. All further references to the manufacturer are limited to Simplex-Grinnell.

All equipment and components shall be the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protected premises protective signaling system, access control, and smoke control. The authorized representative of the manufacturer of the major equipment, such as control panels, shall be responsible for the satisfactory installation of the complete system.

All control panel assemblies and connected field appliances shall be provided by the same system supplier, and shall be designed and tested to ensure that the system operates as specified. The system shall utilize independently addressed, microprocessor-based smoke detectors, heat detectors, as described in this specification. All equipment and components shall be installed in strict compliance with the manufacturer's recommendations.

The equipment to be supplied will be considered only if it meets all sections of the performance specification. Any deviations of system performance outlined in this specification will only be considered when the following requirements have been met:

The supplier shall submit a point-by-point statement of compliance for all sections in this specification. The statement of compliance shall consist of a list of all paragraphs within these sections. Where the proposed system complies fully with the paragraph, as written, placing the word "comply" opposite the paragraph number shall indicate such. Where the proposed system does not comply with the paragraph as written and the supplier feels that the proposed system will accomplish the intent of the paragraph, a full description of the function as well as a full narrative description of how its proposal will meet its intent shall be provided. Any submission that does not include a point-by-point statement of compliance as described herein shall be disqualified. Where a full description is not provided, it shall be assumed that the proposed system does not comply.

1.2 References

1.2.1 Codes

1.2.1.1 Codes – Fire

The equipment and installation shall comply with the latest provisions of the following codes and standards:

NFPA 70 - National Electric Code®
NFPA 72 - National Fire Alarm Code®
NFPA 101- Life Safety Code®
NC Building Code 2012
UL 268 - Smoke Detectors for Fire Protective Signaling Systems.
UL 464 - Audible Signaling Appliances
Federal Codes and Regulations
Americans with Disabilities Act (ADA)
Factory Mutual (FM) approval
International Standards Organization (ISO)
ISO-9000
ISO-9001

1.3 System Description

1.3.1 General

1.3.1.1 General - Fire

The Contractor shall furnish all labor, services and materials necessary to supply and install additional devices and circuitry to an existing complete, functional fire alarm system (System). The System shall comply in respects with all pertinent codes, rules, regulations and laws of the Authority, and local jurisdiction. The System shall comply in all respects with the requirements of the specifications, manufacturer's recommendations and Underwriters Laboratories Inc. (ULI) listings.

It is further intended that upon completion of this work, the Owner be provided with:

-Complete information and drawings describing and depicting the entire system(s) as installed, including all information necessary for maintaining, troubleshooting, and/or expanding the system(s) at a future date.

-Complete documentation of system(s) testing.

-Certification that the entire system(s) has/have been inspected and tested, is/are installed entirely in accordance with the applicable codes, standards, manufacturer's recommendations and ULI listings, and is/are in proper working order. Contractor shall use "Fire Alarm System Certification and Description" as required by NFPA 72 latest edition.

- The electrical contractor shall revise plan drawings of the fire alarm smoke detection system as required here. System floor plans shall be framed under glass and posted on wall adjacent to the location of the new annunciator "ANN". The plan shall be 11" x 17" and shall be framed under glass and posted in a neat manner adjacent to "FACP". Plans shall be black line drawings showing all rooms, stair, columns, doors and correct north arrow. Fire alarm and devices shall be depicted in red color. Provide symbol schedule on each plan. Provide room number in each space where an alarm Initiating device is located. Do not show wiring or conduit system but show, in addition to devices and appliances, all system cabinets, modules, relays and stations.

1.3.2 Description

1.3.2.1 Description - Fire

Area smoke detection device (located as shown on drawings).
Pull station (located on drawings)
Tamper and flow switches (located on drawings).

1.3.3 Operations

1.3.3.1 Sequence of Operations

1.3.3.1.1 General

Upon the alarm activation of any area smoke detector, manual pull station, sprinkler waterflow, the following functions shall automatically occur:

-The internal audible device shall sound at the control panel or command center.
-The LCD display shall indicate all applicable information associated with the alarm condition including; device type, device location and time/date.
-Any remote or local annunciator LCD associated with the alarm zone shall be illuminated.
-Transmit signal to the central station as determined by the owner.
-All automatic events programmed to the alarm point shall be executed and the associated outputs activated.
-All self-closing fire/smoke doors held open shall be released.
-All door locking mechanisms shall be released/deactivated.

1.3.3.1.2 Duct Smoke Activation – (There are no duct smoke detectors)

1.3.4 System Configuration

1.3.4.1 General

All Life Safety System equipment shall be arranged and programmed to provide the early detection of waterflow, the automatic summoning of the local fire department, the override of the HVAC system operation, and the activation of other auxiliary systems to inhibit the spread of smoke and fire, and to facilitate the safe evacuation of building occupants.

1.3.4.4 Notification Appliance Circuits

All notification appliance circuits shall remain the same as existing. All notification appliance circuits shall have a minimum circuit output rating of: 2 amps @ 24 VDC. The notification circuits shall be power limited. Non-power limited circuits are not acceptable.

1.3.4.5 Signaling Line Circuits

Signaling line circuit connecting to addressable/analog devices including, detectors, monitor modules, control modules, intrusion detection & notification circuit modules shall remain the same as existing. All signaling line circuits shall be power limited. Non-power limited circuits are not acceptable.

1.3.4.6 DACT

The system shall have the premise communications capability (DACT) for transmitting system events to the State Capitol Police in Raleigh “Remote Supervising Station”. The system shall provide the SCP with point identification of system events using Contact ID or SIA DCS protocols. In the event of a panel CPU failure during a fire alarm condition, the DACT degrade mode shall transmit a general fire alarm signal to the SCP.

1.3.4.7 Battery Power Capacity

Because the generator is automatically started, the battery shall have only a minimum of 24 hours (instead of 60 hrs) battery power capacity plus 5/15 minutes of full alarm load. Calculations are required to be submitted for battery sizing and EOL voltage drop.

1.4 Submittals

1.4.1 Project

The contractor shall purchase no equipment for the system specified herein until the owner has approved the project submittals in their entirety and has returned them to the contractor. It is the responsibility of the contractor to meet the entire intent and functional performance detailed in these specifications. Approved submittals shall only allow the contractor to proceed with the installation and shall not be construed to mean that the contractor

has satisfied the requirements of these specifications. The contractor shall send submittals electronically or four (4) complete sets of documentation within 30 calendar days after award of contract.

Each submittal shall include a cover letter providing a list of each variation that the submittal may have from the requirements of the contract documents. In addition the Contractor shall provide specific notation on each shop drawing, sample, catalog cut, data sheet, installation manual, etc. submitted for review and approval, of each such variation.

All drawings and diagrams shall include the contractor's title block, complete with drawing title, contractor's name, address, date including revisions, and preparer's and reviewer's initials.

Product Data:

Data sheets with the printed logo or trademark of the manufacturer are required for all equipment. Indicated in the documentation will be the type, size, rating, style, and catalog number for all items proposed to meet the system performance detailed in this specification. The proposed equipment shall be subject to the approval of the Architect/Engineer.

Shop Drawings
A complete set of shop drawings shall be supplied. The shop drawings shall be reproduced electronically in digital format. This package shall include but not be limited to:

-Riser diagrams.
-Complete floor plan drawing locating all system devices and 1/8' = 1'-0 scale plan. Including showing the placement of each individual item of fire alarm equipment as well as raceway size and routing, junction boxes, and conductor size, quantity, and color in each raceway.
-Detailed system operational description. Any Specification differences and deviations shall be clearly noted and marked.
-Complete system bill of material.
-All drawings shall be reviewed and signed off by an individual having a minimum of a NICET Level 4 certification in fire protection engineering technology, subfield of fire alarm systems.
-Installer's Certification
-The engineered systems distributor must be licensed in the state of project location and have been incorporated in the business in that state for a minimum of 5 years.
-Submit a copy of the system supplier's training certification issued by the manufacturer of the integrated life safety system, and a copy of the installing technician's NICET certification.

1.4.2 Close Out

Two (2) copies of the following documents shall be delivered to the building owner's representative at the time of system acceptance. The close out submittals shall include:

-As-Built drawings consisting of a scaled plan of each building showing the placement of each individual item of the Integrated Life Safety System equipment as well as raceway size and routing, junction boxes, and conductor size, quantity, and color in each raceway. All drawings must reflect point to point wiring, device address and programmed characteristics as verified in the presence of the engineer and/or the end user unless device addressing is electronically generated, and automatically graphically self-documented by the system.

-All drawings shall be provided in standard .DXF format.

-The application program listing for the system as installed at the time of acceptance by the building owner and/or local AHJ (disk, hard copy printout, and all required passwords).

-Provide the name, address and telephone of the authorized factory representative. Submit a completed “Record of Completion” per to NFPA 72.

1.5 Quality Assurance

1.5.1 Qualifications of Contractor

1.5.1.1 Fire

The contractor shall have successfully installed similar system fire detection, evacuation voice and visual signaling control components on a previous project of comparable size and complexity. The owner reserves the right to reject any control components for which evidence of successful prior installation performed by the contractor cannot be provided.

The contractor shall have in-house engineering and project management capability consistent with the requirements of this project. Qualified and approved representatives of the system manufacturer shall perform the detailed engineering design of central and remote control equipment. Qualified and approved representatives of the system manufacturer shall produce all panel and equipment drawings and submittals, operating manuals. The contractor is responsible for retaining qualified and approved representative(s) of those system manufacturers specified for detailed system design and documentation, coordination of system installation requirements, and final system testing and commissioning in accordance with these specifications.

1.6 Project Conditions

1.6.1 Project Conditions

It shall be the Contractor's responsibility to inspect the job site and become familiar with the conditions under which the work will be performed.

1.7 Warranty and Maintenance

1.7.1 Spare Parts

1.7.1.1 Spare Parts - Fire

Provide the following spare parts with the system, each individually packaged and labeled:
Fuses ……2 of each size used in the system
Manual Fire Alarm Boxes…….…. 2% of installed quantity
Addressable Control Relays…….. 4% of installed quantity
Indoor Horns/Speakers w/Strobe Lights.... 4% of installed quantity
Indoor Strobe-only Notification Appliances...4% of installed quantity
Monitor Modules (Addressable Interface)…. 4% of installed quantity
Isolation Modules/Isolation Bases……..4% of installed quantity
Addressable, Electronic Heat Detectors……4% of installed quantity
Spot-Type Smoke Detectors/Sounder Bases.. 6% of installed quantity
No spares are required for projected beam, air sampling or duct smoke detectors.

1.7.2 Warranty

The contractor shall warranty all materials for within three (3) years of installation from date of acceptance and workmanship for one (1) year from date of acceptance, unless otherwise specified. A copy of the manufacturer's warranty shall be provided with closeout documentation and included with the operation and installation manuals.
The System Supplier shall maintain a service organization with adequate spare parts stock within 50 miles of the installation. Any defects that render the system inoperative shall be repaired within 24 hours of the owner notifying the contractor.

1.8 Training

1.8.1 Training

The System Supplier shall schedule, and present a minimum of 1 hour of documented formalized instruction for the building owner, detailing the proper operation of the installed System devices. Documentation of this training shall be part of the completion documents.

The instruction shall be presented in an organized and professional manner by a person factory trained in the operation and maintenance of the equipment and who is also thoroughly familiar with the installation.

The instruction shall cover the schedule of maintenance required by NFPA 72 and any additional maintenance recommended by the system manufacturer. Instruction shall also be made available to the Local Municipal Fire Department if requested by the Local Authority Having Jurisdiction.

PART 2 - PRODUCTS

2.1 Manufacturer

2.1.1 Fire

The manufacturer of the system equipment shall be regularly involved in the design, manufacture, and distribution of all products specified in this document. These processes shall be monitored under a quality assurance program that meets the ISO 9000 requirements.

All System components shall be the cataloged products of a single supplier. All products shall be listed by the manufacturer for their intended purpose.

Simplex products constitute the minimum type and quality of equipment to be installed.

All control panel assemblies and connected field appliances shall be both designed and manufactured by the same company, and shall be tested and cross-listed as to ensure that fully functioning equipment is designed and installed.

2.2 Field Mounted System Components

2.2.1 Fire Initiating Devices

2.2.1.1 Smoke Detectors & Accessories

2.2.1.1.1 Analog Addressable Smoke -- General

Each analog addressable smoke detector's sensitivity shall be capable of being programmed individually as: most sensitive, more sensitive, normal, and less sensitive or least sensitive. In addition to the five sensitivity levels the detector shall provide a pre-alarm sensitivity setting, which shall be settable in 5% increments of the detector's alarm sensitivity value.

An alternate alarm sensitivity level shall be provided for each detector, which can be set to any of the five (5) sensitivity settings manually or automatically using a time of day event. In addition to the five alternate sensitivity levels the detector shall provide an alternate pre-alarm sensitivity setting, which shall be settable in 5% increments of the detector's alternate alarm sensitivity value.

The detector shall be able to differentiate between a long drift above the pre-alarm threshold and fast rise above the threshold.

The detector's sensing element reference point shall automatically adjust, compensating for background environmental conditions such as dust, temperature, and pressure. Periodically, the sensing element real-time analog value shall be compared against its reference value. The detector shall provide a maintenance alert signal that 75% to 99% compensation has been used. The detector shall provide a dirty fault signal that 100% or greater compensation has been used.

The system shall allow for changing of detector types for service replacement purposes without the need to reprogram the system. The replacement detector type shall automatically continue to operate with the same programmed sensitivity levels and functions as the detector it replaced. System shall display an off-normal condition until the proper detector type has been installed or change in the application program profile has been made.

2.2.1.1.2 Smoke Detector - Photoelectric

Provide analog/addressable photoelectric smoke detectors at the locations shown on the drawings. The detector shall have the ability to set the sensitivity and alarm verification of each of the individual detectors on the circuit. It shall be possible to automatically change the sensitivity of individual analog/addressable detectors for the day and night periods. Each smoke detector shall be capable of transmitting pre-alarm and alarm signals in addition to the normal, trouble and need cleaning information. It shall be possible to program control panel activity to each level. Each smoke detector may be individually programmed to operate at any one of five (5) sensitivity settings. Each detector microprocessor shall contain an environmental compensation algorithm that identifies and sets ambient environmental thresholds approximately six times an hour. The microprocessor shall monitor the environmental compensation value and alert the system operator when the detector approaches 75% and 100% of the allowable environmental compensation value.

2.2.2 Detector Bases

2.2.2.1 Detector Base - Standard
Provide standard detector mounting bases suitable for mounting on either a North American 1-gang, 3½ or 4-inch octagon box and 4-inch square box, or European BESA or 1-gang box. The base shall contain no electronics and support all series detector types.

2.2.3 Notification Appliances

2.2.3.1 Horn-Strobes (There are no H/S)

2.2.3.1.1 Horn-Strobes
Provide wall mounted horn/strobes at the locations shown on the drawings. The horn/strobe shall provide an audible output of 84 dBA at 10 ft. when measured in reverberation room per UL-464. Strobes shall provide synchronized flash outputs. The strobe output shall be field selectable, determined as required by its specific location and application from a family of 15cd, 30cd, 75cd and 110cd. The horn shall have a selectable steady or synchronized temporal output. In and out screw terminals shall be provided for wiring. Low profile horn/strobes must be used and mount in a North American 1-gang box.

2.2.3.2 Strobes (There are no strobes)

2.2.3.2.1 Strobes
Provide wall mounted strobes at the locations shown on the drawings. Ceiling mounted strobe devices shall also be provided at locations shown on the drawings. In and out screw terminals shall be provided for wiring. Strobes shall provide synchronized flash outputs. Strobe output shall be field selectable, as required by its specific location and application, from a family of 15cd, 30cd, 60cd, and 110cd. Low profile strobes must be used and mount in a North American 1-gang box.

PART 3 - EXECUTION

3.1 Installation

3.1.1 General
All equipment shall be attached to walls and ceiling and shall be mounted firmly in place. Detectors shall not be supported solely by suspended ceilings. Fasteners/supports shall be sized to support the required load.

3.1.2 Conduit Raceway

All system and system components listed to UL864 Control Units for Fire Protective Signaling Systems must installed within a common conduit raceway system, in accordance with the manufactures recommendations. All system conductors shall be in conduit raceway. Systems or system components not listed to the UL864 standard shall utilize a separate conduit raceway system for each of the sub-systems.

The requirements of this section apply to all system conduits, raceways, electrical enclosures, junction boxes, pull boxes and device back boxes:

-All system conduits shall be of the sizes and types specified.

-All system conduits shall be EMT, ¾ inch minimum, except for flexible metallic conduit used for whips to devices only.

-All system conduits, which are installed in areas, which may be subject to physical damage or weather, shall be IMC or rigid steel, ¾ inch minimum.

-Conduits shall be sized according to the conductors contained therein.

-All fire alarm conduit systems shall be routed and installed to minimize the potential for physical, mechanical or by fire damage, and so as not to interfere with existing building systems, facilities or equipment, and to facilitate service and minimize maintenance.

-All conduits shall be solidly attached to building structural members, ceiling slabs or permanent walls.

-All system conduits, junction boxes, pull boxes, terminal cabinets, electrical enclosures and device back boxes shall be readily accessible for inspection, testing, service and maintenance.

3.1.3 Test & Inspection

All intelligent analog addressable devices shall be tested for current address, sensitivity, and user defined message.

All wiring shall be tested for continuity, shorts, and grounds before the system is activated.

All test equipment, instruments, tools and labor required to conduct the tests shall be made available by the installing contractor.

The system including all its sequence of operations shall be demonstrated to the Owner, his representative, and the local fire inspector. In the event

the system does not operate properly, the test shall be terminated. Corrections shall be made and the testing procedure shall be repeated until it is acceptable to the Owner, his representatives and the fire inspector.

At the final test and inspection, a factory trained representative of the system manufacturer shall demonstrate that the system functions properly in accordance with these specifications. The representative shall provide technical supervision, and participate during all of the testing for the system.

All fire alarm testing shall be in accordance with National Fire Alarm Code, NFPA 72 - 2007.

A letter from the Contractor certifying that the additional devices are installed entirely in accordance with the system manufacturer's recommendations and within the limitations of the required listings and approvals, that all system hardware and software has been visually inspected and functionally tested by a manufacturer's certified representative, and that the system is in proper working order shall be sent to the designing engineer.

3.2 Documentation

3.2.1 The contractor must submit the following documentation to the owner, through the Engineer, prior to the system acceptance inspection.

3.2.2 Written verification that this Code-required 100% system test was done on NFPA 72 "Record of Completion" Form. Use only the referenced form, or an identical reprint. No substitutions are acceptable.

3.2.3 The fire alarm system will be inspected, with portions of it being functionally tested. This normally includes 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 the off-premises supervising station. This statistical (sampling) inspection is intended to assure that the contractor has properly installed the system and has done a thorough 100% operational test as required by NFPA 72.

The Fire Alarm Contractor shall provide the two-way radios, ladders, and any other materials needed to test the system (smoke candles, smoke cans, test magnet, etc.). The complete installation shall conform to the applicable sections of NFPA-72, Local Codes

END OF SECTION

22 – PLUMBING

22 00 10 - GENERAL PROVISIONS

PART 1 - GENERAL

1.01 SCOPE:

The scope of the plumbing phase of this project shall include all labor, materials, equipment, etc., required to fulfill the intent of the Contract Documents and shall include the work specified under the subsequent sections of Division 22 of these specifications.

1.02 RELATED DOCUMENTS:

All applicable provisions of the general conditions shall govern work under this Division. Refer to these articles in the specifications for additional information.

1.03 REFERENCE STANDARDS:

1.03.1 All work shall be performed in full accordance with the latest editions of the applicable state, and national building codes and local ordinances.

1.03.2 Refer to each section for applicable codes and reference standards.

1.04 FEES, PERMITS AND TAXES:

This Contractor shall make arrangements for and pay for all inspection fees, connections fees and permits required by local authorities. The Contractor shall also pay all taxes levied for labor and materials associated with work under this Division.

1.05 SUBMITTALS:

1.05.1 The symbol "<S>" indicates a requirement for submittals.

1.05.2 In addition to the requirements of the above referenced portions of this specification, all contractors proposing to do work under this Division shall comply with the following additional requirements:

A. These specifications and drawings are intended to indicate a standard of quality for materials and equipment which is established by the listing of manufacturers' names and catalog numbers and/or by referenced standards. Materials and equipment that do not comply with these standards of quality will not be considered for substitution.

B. As soon as practicable and within thirty (30) days after the award of the contract and before beginning the fabrication of any material or the installation of any equipment, data shall be submitted for approval on equipment and materials where noted. Materials (pipe,

fittings, etc.) may be listed with the name of the manufacturer and identifying catalogue numbers. Data for equipment shall include manufacturer's name, catalogue data, diagrams, drawings and other descriptive data as required or requested by the Architect/Engineer for evaluation.

C. Notwithstanding any reference in the specifications to any article, device, product, material, fixture, form or type of construction by name, make or catalogue number, such references shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition; and the Contractor, in such cases, may at his option use any article, device, product material, fixture, form or type of construction which in the judgment of the Architect/Engineer expressed in writing, is equal to that specified.

D. All data shall be carefully examined and shall be forwarded for approval with a signed certification to the effect that the data has been carefully checked and found to be correct with respect to dimensions and available space and that the equipment complies with all requirements of the specifications.

E. Point out in writing all deviations between the plans and specifications and the materials submitted.

F. It is understood that proof of equality is the responsibility of the Contractor and/or supplier and that it is not the responsibility of the Architect/Engineer to prove the inequality of the proposed substitutions. Furthermore the decisions of the Architect/Engineer are final.

1.05.5 While it is not the intention of the Architect/Engineer to discriminate against any manufacturer of equipment which is equal to specified equipment, a strict interpretation of such equality will be exercised by the Architect/Engineer in considering any equipment offered as a substitute for equipment named in the specification It shall be the responsibility of the Contractor to submit with each request for approval of substitute material or equipment, sufficient data to show conclusively that it is equal to the material or equipment specified.

1.05.6 Each Contractor shall submit shop drawings and/or diagrams for approval and for job coordination in all cases where significant deviations from the contract drawings are contemplated because of job conditions, interferences, or substitutions of equipment, or when requested by the Architect/Engineer for purposes of clarification of the Contractor's intent. He shall also submit detailed shop drawings, rough-in sheets, etc., for all special or custom built items of equipment.

1.05.7 Submittal of shop drawings shall be made in sufficient copies to provide one (1) copy of all data to be retained by the Engineer; two (2) copies of all data to be accumulated for the Owner; one (1) copy of all data to be retained by the Contractor; one (1) copy of all data to be retained by the architect.

1.05.8 Should any substitute items be submitted and disapproved, then those items must

be furnished exactly as described herein.

1.05.9 The review of shop drawings and/or submittal data shall not relieve the Contractor of responsibility for deviations from the contract drawings or specifications.

1.05.10 The size of mechanical equipment shown on the drawings is based on the dimensions of a particular manufacturer. While other manufacturers may be acceptable, it is the responsibility of the Contractor to determine if the equipment he proposes to furnish will fit in the space. Shop drawings shall be prepared when required by the Architect/Engineer or Owner to indicated a suitable arrangement.

1.05.11 One quarter (1/4) inch scale reproducible shop drawings shall be prepared and submitted for approval to indicate a suitable arrangement in all mechanical rooms, to include but not limited to piping, fittings and valves, equipment and accessories. All drafting shall be done by a qualified draftsperson. The engineer reserves the right to request resumes of drafting personnel or drafting service.

1.06 OPERATING AND MAINTENANCE MANUALS AND INSTRUCTIONS:

1.06.1 The symbol "<OM>" indicates a requirement for operating and maintenance manuals to be furnished.

1.06.2 The Owner's operating personnel shall be instructed by the Contractor on how to start and operate each item of equipment. Safety features shall be pointed out, particularly the possible troubles which might cause the safety controls to operate and what might be done to remedy the trouble.

1.06.3 Provide (4) four copies of operating and maintenance manuals. Manuals shall be bound in large ring, loose-leaf binders and contain the following:

A. Manufacturer's instructions and/or installation manual.

B. Manufacturer's service manual.

C. Manufacturer's lubrication chart listing types of lubricant to be used on each item of equipment and recommended frequency of lubrication.

D. Electrical diagrams of each equipment "packaged" control system.

E. Parts lists and identifying part numbers with prices of each part. The name and address of the nearest distributor from which parts can be obtained.

1.07 WARRANTY

1.07.1 This contractor shall warrant all workmanship, material, equipment systems, etc., provided by him for a period of one year after final acceptance of the project by the owner. This warranty means that this contractor shall make good to the Owner, at no cost, any defects that become apparent during the year. This warranty is in addition to any other guarantees or warranties and is not intended to limit such other guarantees or warranties.

1.07.2 This contractor shall give a letter of guarantee stating the dates the guarantee period begins and ends. Furnish the Architect/Engineer with (3) copies of letter of guarantee.

1.08 DEFINITIONS: The following words and phrases as used herein are hereby defined:

1.08.1 "provide": Furnish and install all material and labor required for a complete installation ready for operation in accordance with the intent of the Contract Documents.

1.08.2 "as required": Indicates that the Contractor shall perform the work or provide the material as indicated in accordance with manufacturer's installation instructions; and in accordance with applicable codes or regulations; and in a workmanlike manner as defined by good local practice.

1.08.3 "or equal": Indicates that the Contractor may substitute equipment by another manufacturer if the salient features of the equipment indicated by manufacturer's name and/or described are, in the judgment of the Architect/Engineer, adequate. Submittals for approval are required where indicated.

1.08.4 "contractor": Where the word(s) "Contractor" or "this Contractor" is/are used, that refer to the Contractor engaged to execute the work under this division of the specifications only, even though he may be technically described as a sub-contractor.

1.08.5 "intent of the Contract Documents": The specific intent of these documents is to provide to the Owner, in a thoroughly functional condition, all the various systems, equipment, etc., indicated herein. Final authority over interpretation of the "intent" shall rest with the Architect/Engineer.

1.08.6 "shall": Indicates a mandatory requirement.

1.09 INSPECTION OF THE SITE:

1.09.1 The drawings are prepared from the best information available and reflect all conditions commensurate with this information. However, the contractor shall visit the site prior to submitting a proposal and should verify the locations, sizes, depths, pressures, etc., of all existing utilities and familiarize himself with working conditions, hazards,

existing grades, soil conditions, obstructions, etc. If it becomes evident that existing site conditions will impair the proper operation of the utilities, the Architect/Engineer shall be notified in writing.

1.09.2 All proposals shall take these existing conditions and any revisions required into consideration.

1.09.3 The submission of a bona fide bid will be considered as evidence that the contractor has inspected the job site and understands the conditions under this contract work must be fulfilled.

1.09.4 Contract cost changes will be negotiated for conditions found during construction which were not visible to a thorough on-site inspection and which were unknown to the Architect/Engineer or Contractor prior to receipt of bids.

1.10 CONSTRUCTION REQUIREMENTS:

1.10.1 The Contractor shall be responsible for fitting his material and apparatus into the building and shall carefully lay out his work at the site to conform to the structural conditions, to provide proper grading of lines, to avoid all obstructions and to conform to the details of the installation supplied by the manufacturer of the equipment to be installed. Furnish all necessary pilot lines and control lines whether indicated on the drawings or not. The drawings do not give exact details as to elevations of pipe lines nor do they show exact locations of pipe to scale. Piping elevations shall be handled by giving precedence to pipes which require a stated grade for proper operation. Devices necessary for installation and support of pipes, and equipment (such as sleeves, inserts, etc.) shall be located and installed as the construction progresses in order to allow completion of each phase of the work in the proper sequence.

1.10.2 Drawings showing the extent and arrangement of the work of a particular trade shall be used together with drawings showing extent and arrangement of work of other trades to insure that the Contractor in laying out and installing his work shall do so in a manner such that the work of the several trades may progress in the most direct, workmanlike and harmonious manner.

1.10.3 The Contractor shall be responsible for the proper location and size of slots, holes or openings in the building structure pertaining to his work, and for the correct location of pipe sleeves. The drawings indicate the extent and general arrangement of the various systems, but if any departures from these drawings are deemed necessary by the contractor, detailed drawings and descriptions of these departures and a statement of the reasons therefore shall be submitted to the Architect/Engineer as soon as practicable. No departures from the arrangements shown on the drawings shall be made without prior written approval of Architect/Engineer.

1.10.4 In general, piping in finished areas of the building shall be run concealed unless noted and directed otherwise. Should any conditions arise which would cause any piping

to be exposed in finished areas, it shall be immediately called to the Architect/Engineer's attention. In unfinished spaces such as equipment rooms, all pipe shall be run as high as possible, shall be run to a continuous grade and shall be grouped wherever it is feasible to do so.

1.10.5 Equipment shall be installed in such a manner to make oiling devices and parts requiring service and maintenance readily accessible.

1.10.6 All pipe, etc., shall be cut accurately to measurements established at the building and shall be worked into place without springing or forcing. All pipes run exposed in machinery and equipment rooms shall be installed parallel to the building planes except that the lines shall be sloped to obtain the proper pitch. Piping run above furred ceilings, etc., shall be similarly installed, except as otherwise shown. All pipe openings shall be kept closed during construction until the systems are closed with final connections.

1.10.7 The construction details of the building are illustrated on the Architectural and Structural Drawings. The trades shall thoroughly acquaint themselves with the details before submitting their bid as no allowance will be made because of unfamiliarity with these details. For new construction, place all inserts to accommodate the ultimate installation of pipe hangers in the forms before concrete is poured and set sleeves in forms before construction. For existing construction, all required inserts shall be "drilled-in" and all openings required through concrete or masonry shall be "saw-cut" or "core drilled" with tools specifically designed for this purpose. Explosive or compression driven inserts shall only be allowed for use as approved by the manufacturer of these devices. All concealed lines shall be installed as required by the pace of the job to precede the general construction.

1.10.8 The plumbing plans do not give exact locations of outlets, fixtures, equipment items, etc. The exact location of each item shall be determined by reference to the general plans and to all detail drawings, equipment drawings, roughing-in drawings, etc., by measurements at the building and in cooperation with other trades. Minor relocations necessitated by the conditions at the site or directed by the Owner shall be made without additional cost to the Owner.

1.10.9 All oiling devices and all parts of equipment requiring adjustment shall be easily accessible. Equipment shall be so located and installed as to permit convenient and safe maintenance and future replacement. The contractor furnishing the equipment shall be responsible prior to ordering same in the event that equipment specified and/or approved is incompatible with this requirement.

1.11 SLEEVES:

1.11.1 Each and every pipe, regardless of material, which passes through a concrete slab, (except slab on grade), masonry wall, roof or other portion of the building structure shall be free from the structure and shall pass through a sleeve furnished and installed by this contractor responsible for the work involved.

1.11.2 Above grade and dry location sleeves shall be constructed from 20 to 22 gauge galvanized or black steel and shall be flush on both sides of wall surface penetrated. The sleeves shall be sized to allow free passage of the pipe to be inserted, and when this pipe is to be insulated, the sleeves shall be large enough to pass the insulation. Floor sleeves located in pipe chases shall extend up two inches (2") above the floor slab. Allow for expansion and contraction movement of the piping.

1.11.3 Sleeves passing through walls or floors on or below grade and/or in moist areas shall be constructed of galvanized steel, schedule 40 steel pipe and shall be designed with suitable flange in the center of the floor or wall to form a waterproof passage. After the pipes have been installed in the sleeves, void space around the pipe shall be caulked to insure a waterproof penetration. Fire ratings of rated walls and floors shall be maintained by the use of approved materials.

1.11.4 Sleeve ends shall be cut straight and true by power saw or roll cutter. Torch cut ends will not be acceptable.

1.12 ISOLATION

1.12.1 Transmission of perceptible vibration, structure-borne noise, or objectional air borne noise to occupied areas by equipment installed under this contract will not be permitted.

1.12.2 The isolation supplier shall be a firm or individual capable of dealing effectively with vibration and noise characteristics, effects and criteria and have facilities and capabilities for measuring and evaluating such disturbances and the preparation of drawings and installation instructions.

1.13 CONSTRUCTION SAFETY:

This contractor assumes all responsibility regarding the safety of his personnel on the project during construction. The Contract Documents do not include materials, procedures, components, etc., required to insure construction safety. Refer to General Conditions and Supplementary General Conditions for additional information.

1.14 DAMAGE:

1.14.1 This Contractor shall be responsible for damage to project caused by this Contractor's failure to recognize hazards associated with items such as leaks, scheduling of work, inexperienced workmen, excessive cutting, etc.

1.14.2 This Contractor shall repair, at no expense to the Owner, any such damage.

1.14.3 This contractor shall familiarize himself with working conditions to the extent that he shall be responsible for damage to concealed piping, wiring and other equipment to

remain and shall repair any damage caused by his negligence at no cost to the Owner.

1.15 FLOOR, CEILING AND WALL PLATES:

1.15.1 Refer to General Conditions.

1.15.2 In addition to the requirements of the above referenced portions of this specification, this contractor shall furnish a chromium plated sectional escutcheon in each finished space on each pipe or hanger rod penetrating a wall, floor or ceiling. Escutcheons shall be sized to fit snugly to all lines and where the lines are insulated, the escutcheons shall be fit snugly over the insulation. These plates shall be provided with set screws so that they fit snugly against the finished surface. All equipment rooms are classified as finished space.

1.16 IDENTIFICATION:

1.16.1 Each piece of equipment; every valve whose service and/or duty is not readily apparent; each zone duct, outside air duct and return air duct whose duty is not immediately apparent; every piping system except cast iron sewer lines, shall be permanently and clearly identified.

1.16.2 Equipment, valves, etc. shall be provided with laminated phenolic nameplates, appropriately engraved with proper identification correlated to the designation shown on the drawings. Punched plastic tape will not be acceptable.

1.16.3 Piping systems shall have designation on twenty foot (20'-0") centers and closer where required to provide adequate identification, using pipe markers with direction of flow and service indication. Exposed piping systems and piping located in mechanical rooms shall be painted and stenciled identifying the system. Color scheme shall be as follows:

Fire Line	- Red
Gas Pipe	- Yellow
Domestic Water	- Green

1.16.4 All these pipe markers shall conform to ANSI-A-13 "Scheme for the Identification of Piping Systems". Arrow markers must have the same ANSI background colors as their companion pipe markers. All marks shall be as manufactured by Seaton or approved equal.

1.16.5 A typewritten chart, framed under glass, shall be provided which shall correlate all such identification, abbreviations, valve numbers, color schemes, etc.

1.16.6 Contractor shall obtain written approval of proposed identification scheme prior to application.

1.16.7 Provide engraved rigid phenolic, 3" x 1" with 1/4" minimum letters fastened to the ceiling grid "tee" bar at each location where a branch stop valve or group of valves is located above the adjacent ceiling tile. The tag shall be engraved "Domestic Water Branch Valve Located Above."

1.17 SAFETY GUARDS:

Contractor shall furnish and install all safety guards required. All belt driven equipment, projecting shafts and other rotating parts shall be enclosed or adequately guarded.

1.18 STORAGE OF MATERIALS:

Each contractor shall provide space for storage of materials, equipment or tools at ground level. Any storage contemplated within the building will be allowed only upon specific approval of the Architect.

1.19 SUPERVISION:

All work under this contract shall be under the direct supervision of a competent foreman thoroughly experienced in the type work being performed. If, in the opinion of the Architect/Engineer, the foreman is not "running" the job satisfactorily, he shall be replaced by a foreman acceptable to the Architect/Engineer. The job foreman shall not be removed from the project without written notice from the contractor to the Architect/Engineer.

1.20 MANUFACTURERS' DIRECTIONS:

The manufacturers' published directions shall be followed in the delivery, storage, protection, installation, piping and wiring of all equipment and material. The Contractor shall promptly notify the Architect/Engineer in writing of any conflict between the requirements of the contract documents and the manufacturers' directions and shall obtain the Architect's/Engineer's instructions before proceeding with the work. Any such work performed that does not comply with the manufacturers' directions shall have deficiencies corrected at no cost to the Owner.

1.21 ROCK EXCAVATION:

1.21.1 All loose or soft rock shall be removed from excavations without extra cost to the Owner. Should rock be encountered, the Plumbing Contractor shall notify the Architect/Engineer so that the volume of rock to be removed can be computed and the unit price for its removal negotiated (if the unit price is not otherwise stated in the contract) prior to its removal.

1.21.2 Rock shall be defined as large (not removable by a 1/2 cubic yard mechanical digger) solid material yielding a metallic ring when struck with a metal hammer and requiring drilling and blasting.

1.21.3 The Plumbing Contractor shall obtain and import from another source the necessary amount of earth required for interior and exterior fills. Such earth shall be clean clay which is free from top soil or any form of vegetation. Earth shall be suitable for the purpose intended and approved by the Architect/Engineer.

PART 2 - PRODUCTS

2.01 MATERIALS:

All materials shall be new and free from defects at the time of installation. Materials or equipment damaged in shipment or otherwise damaged prior to installation shall not be repaired at the job site, but shall be replaced with new materials.

2.02 MANUFACTURER'S REQUIREMENTS:

When a manufacturer's name appears in these specifications, it is not to be construed that the manufacturer does not have to meet the full requirements of the specifications or that his standard cataloged item will be acceptable.

2.03 SERVICE AND REPAIR PARTS:

All equipment installed on this project shall have local representation, local factory authorized service, and a local stock of repair parts.

2.04 FLAME SPREAD PROPERTIES OF MATERIALS:

All materials and adhesives used for insulation shall conform to NFPA and UL life, safety and flame spread properties of materials. The composite classifications shall not exceed 25 for a flame spread rating and 50 for a smoke developed rating for these classifications as listed for the basic materials. The finishes, adhesives, etc., specified for each system and shall be such when completely assembled.

2.05 ACCESS PANELS:

Provide flush mounted metal access panels and frames with concealed hinges and key actuated locks for all concealed and otherwise inaccessible valves, parts, fittings, equipment, filters, etc. and as required for inspection or service.

PART 3 - EXECUTION

3.01 WORKMANSHIP:

3.01.1 All work shall be done by experienced craftsmen skilled in the applicable trade.

3.01.2 Sloppy work shall be rejected and corrected at no additional expense.

3.02 PROTECTION OF EQUIPMENT:

The Contractor shall continuously maintain adequate protection of stored materials and installed equipment. Fixtures and equipment, located inside or outside shall be protected against dirt, rust, moisture and abuse from other trades. Materials and equipment shall not be stored directly on the ground. Piping and equipment shall not be used by other trades as supports for scaffolds for personnel. At the completion of the work, equipment, fixtures, exposed supports and piping shall be vacuumed free of loose dirt and cleaned to the satisfaction of the Architect/Engineer. Repairs made necessary by damage shall be paid for by the Contractor. Acceptance by the Owner of piping systems in nowise relieves the contractor of the responsibility of correcting systems malfunctioning or replacing valves damaged as a result of dirt or debris left inside the equipment or piping during construction.

3.03 PROTECTION OF STRUCTURE:

Each Contractor in performing his work shall take particular care not to damage the structure. All finished floors and step treads shall be covered to prevent any damage by workmen or their tools and equipment during the construction of the building. In addition, each Contractor shall protect any materials on the job site whether a part of this contract or the property of another Contractor.

3.04 LARGE EQUIPMENT:

All large pieces of equipment which will be installed in the building, and which are too large to permit access through doorways, stairways or shafts, shall be brought to the job by the Contractor and placed in the spaces before the enclosing structure is closed in.

3.05 FOUNDATIONS:

3.05.1 Concrete foundations required by plumbing equipment shall be constructed by this Contractor. See Concrete Work.

3.05.2 Equipment shall be set in place on the bases, leveled and aligned by means of shims, piped, then grouted in, in that order. After grouting, the forms shall be removed and the surfaces of the foundation shall be hand-rubbed with carborundum. Concrete work shall conform to the requirements of General Specifications, Concrete Work, of this specification.

3.06 CONFLICTS, INTERFERENCES AND COORDINATION BETWEEN TRADES:

3.06.1 The drawings are not to be construed as shop drawings, but indicate the extent, general location, arrangement, etc., of piping systems and equipment. This Contractor shall refer to other sections of the specifications and other drawings such as electrical, structural, architectural, etc., in order to eliminate conflicts and undue delays in the progress of the work. Where other Contractors furnish items requiring piping connections by this Contractor, they will be held responsible for providing roughing-in drawings and assistance upon request.

3.06.2 Each trade shall so harmonize its work with that of the other trades so that the work may be done in the most direct and workmanlike manner without hindering the other trades. Piping interference shall be handled by giving precedence to pipe lines which require a stated grade for proper operation. Where space requirements conflict, the following order of precedence shall be observed:

A. Building lines

B. Structural members

C. Soil and drain piping

D. Vent piping

E. Refrigerant piping

F. Condensate piping

G. Ductwork

H. Domestic water

I. Electrical conduit

J. Natural gas piping

3.06.3 In the event of conflicts between specifications and drawings, drawings shall take precedence over specifications except in matters pertaining to quality, applications, and coordination between trades, which shall be governed by specifications.

3.06.4 Code and regulation requirements govern where drawing and/or specifications are in conflict with any code or regulation. However, where drawings and specifications exceed the requirements of any code or regulation, the drawings and specifications shall govern. If the Contractor observes that the drawings and specifications are at variance with applicable codes, he shall promptly notify the Architect/Engineer in writing and any

necessary change shall be negotiated as provided in the contract for changes in the work. If the contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations, and without prior notice to the Architect/Engineer, he shall bear all costs of labor and material necessary to rectify unacceptable work or installation.

3.06.5 In the event of conflict between manufacturer's installation instructions and the drawings, the manufacturer's installation instructions shall govern.

3.07 CUTTING AND PATCHING:

3.07.1 All cutting required by the installation of sleeves, piping, equipment, etc., shall be coordinated with the General Contractor, but performed by this Contractor. Patching shall be by the General Contractor. This Contractor shall not cut any structural element or any finished work without written permission from the Architect/Engineer. Failure of the Plumbing Contractor to furnish his requirements prior to building construction and failure to coordinate his work with other contractors shall make the Plumbing Contractor responsible for cost of proper removal (chasing) and repair of general construction work to provide for installation of the plumbing work. Written approval shall be obtained from the Architect/Engineer before cutting any structural member or finished work. The cost of cutting and reinforcing of any structural member to accommodate plumbing work shall be the responsibility of the Plumbing Contractor and shall be done by craftsmen experienced in the craft involved and in a manner acceptable to the Architect/Engineer. All Plumbing pipes penetrating walls shall be sealed in rated and non-rated walls.

3.07.2 This Contractor shall cut and patch all paving as required by the installation of buried piping, including utilities.

3.08 CONCRETE WORK:

This Contractor shall provide all forming, reinforcing and concrete as indicated such as equipment bases, plumbing stack support pads, grease interceptors and headwalls. Work shall conform to applicable portion of Division 3 CONCRETE.

3.09 PAINTING:

3.09.1 The Plumbing Contractor shall "touch up" paint, to restore to original "new" appearance, all equipment installed under this contract on which the factory applied finish was damaged or scratched during construction or which does not have a finished paint or other outer coating and which is not otherwise to be painted by the General Contractor. This shall include pumps, tanks, cast iron valves, manhole covers, meter box covers, valve box covers, cast iron cleanout covers and cast iron floor grates, both inside and outside the building. Surfaces shall be wire brushed to remove all dirt, scale and mortar prior to painting with flat black rust preventive paint suitable for damp atmosphere.

3.09.2 Exposed copper pipe and bronze body and copper body valves and fittings shall be thoroughly cleaned with a rubbing of fine steel wool.

3.09.3 All structural steel, hangers, rods, etc., installed by this contractor whether concealed or exposed shall be wire brushed to remove dirt and scale and painted with one (1) full cover coat of rust preventive primer. Hangers in concealed areas need not be painted unless otherwise specified. Surfaces inaccessible after placement shall be painted prior to placement.

3.10 TRENCHING AND BACKFILL:

3.10.1 All necessary excavation and backfill for the installation of plumbing work shall be accomplished by this contractor under his phase of the work. All such work shall be included regardless of the type of materials encountered in the excavation.

3.10.2 Trenches for all underground piping shall be excavated to the required depths. The banks of trenches shall be kept as nearly vertical as practicable and where required shall be properly formed and braced. Trenches shall be not less than 12" wider than the outside diameter of the pipe to be laid therein. The bottoms of the trenches shall be tamped hard and graded to secure proper fall. Bell holes shall be excavated to a depth 6" below the bottom of the pipe and shall be backfilled to the proper grade with pea gravel or sand thoroughly tamped. Pipe laid in trenches dug in fill shall be supported down to load bearing undisturbed soil. After the pipes have been tested, inspected and approved by inspecting authorities, the trenches shall be backfilled.

3.10.3 The trenches beneath and within six feet of the building shall be carefully backfilled with an approved river sand to a depth of six (6) inches above the top of the pipe. The next layer and subsequent layers of backfill may be excavated materials if of earth, loam, sand or gravel free of large clods and with rocks no larger than 1 - 1/2" in diameter. Backfill shall be installed in layers 12" deep, adequately tamped and wetted down before the next layer of earth is laid in place. This additional material required for backfilling shall be furnished and any excess materials and debris shall be removed from the site. Any special backfill material shall be provided as specified or shown on the drawings.

3.10.4 All excavating and backfilling shall be done in a manner so as not to disturb adjacent structures and any shoring required shall be provided.

3.11 LUBRICATION:

This Contractor shall provide all lubricants for the operation of all equipment until acceptance. The Contractor shall be required to protect all bearings during the installation and shall thoroughly grease steel shafts to prevent corrosion. All motors and other equipment shall be provided with covers as required for proper protection during construction. All equipment bearings requiring periodic lubrication shall be provided with proper fittings for this purpose. Where equipment requiring such lubrication is not readily accessible due to location, copper tubing extensions shall be provided in addition to lubrication fittings.

3.12 ELECTRICAL WORK:

3.12.1 Under Division 26, power wiring shall be provided up to termination point consisting of a junction box, trough, starter or disconnect switch. Under Division 26 line side terminations shall be provided. Wiring from the termination point to the plumbing equipment, including final connections, shall be provided under Division 22 (Plumbing). Combination disconnects/ motor starters shall be provided by the respective plumbing contractor unless specifically stated otherwise in these specifications.

3.12.2 Wiring for all controls and interconnecting wiring for the installation of power wiring will be done under Electrical Work. The furnishing of all disconnect switches as required for proper operation as shown on the drawings and required by code will be under Electrical Work, except where specifically designated on the plans. The furnishing of all starters for equipment will be done under this section (Plumbing) of these specifications.

3.12.3 Furnishing of complete wiring diagrams showing power wiring and interlock wiring shall be work under the trade supplying the equipment. Diagrams shall be based on approved equipment and shall be complete integral drawings, not a series of manufacturer's individual diagrams. After these diagrams have been approved by the Architect/Engineer, copies shall be furnished to the trades involved and they shall be followed in detail.

3.12.4 The electrical design and drawings are based on the equipment scheduled and shown on the drawings and should any plumbing equipment requiring changes to the electrical design be approved, the required electrical changes shall be made at the expense of the trade furnishing the changed equipment and at no cost to the Owner.

3.13 EQUIPMENT CONNECTION:

This Contractor shall bring required services to equipment items furnished under other sections of this specification or by the Owner, make final connections, and leave equipment ready for operation. Where it is necessary for Contractors performing work covered by this section to make final connections to items of equipment being furnished by Contractors under other sections, all such work shall be performed in a neat and workmanlike manner and all materials shall be of quality and finish normally used for such installation.

3.14 OPERATION PRIOR TO COMPLETION:

When any piece of mechanical or electrical equipment is operable and it is to the advantage of the Contractor to operate the equipment, he may do so providing that he properly cleans the equipment, installs clean filter media, properly adjusts and completes all punch list items before final acceptance by the Owner. The date of acceptance and the start of the warranty may not be the same date.

3.15 EQUIPMENT AND ARRANGEMENTS:

All equipment shall be installed in a manner to permit access to all surfaces requiring access. All valves, motors, drives, lubrication devices, filters and other necessary items shall be installed in a position to allow removal for service without disassembly of another part.

3.16 EXECUTION OF WORK:

The Contractor shall plan, schedule and execute his work and that of any of his Sub-contractors so as not to interfere with the work of other trades or Contractors in the building or on the premises.

3.17 FLASHING AND WATERPROOFING:

All building penetrations to outside shall be flashed and counter flashed as required to eliminate leaks.

3.18 TESTS:

All tests shall be made by this Contractor and repeated until approved by the Architect/Engineer. Piping systems shall not be covered or otherwise concealed until tests have been made and approvals obtained. Notify the Engineer two days prior to tests to allow for scheduling. Test the piping systems as indicated in applicable articles.

3.19 CLEAN-UP:

3.19.1 It shall be the responsibility of each trade to cooperate fully with the other trades on the job to help keep the job site in a clean and safe condition. At the end of each day's work, each trade shall properly store all of his tools, equipment, any surplus materials and all debris caused by his portion of the work.

3.19.2 When all work has been finally tested, the Contractor shall clean all work installed by him, including all fixtures, equipment, pipes, etc. and all exposed work. All pipes shall be flushed out and left free of all obstructions. All plates, access doors, floor drains, clean out covers and other finished products shall be thoroughly cleaned and polished.

3.20 FINAL INSPECTIONS:

3.20.1 It shall be the duty of the Contractor to make a careful inspection trip of the entire project, assuring himself that the work on the project is ready for final acceptance, before calling upon the Architect/Engineer to make a final inspection.

3.20.2 In order not to delay final acceptance of the work, the Contractor shall have all necessary bonds, guarantees, receipts, affidavits, etc., called for in the various articles of this specification, prepared and signed in advance, and together with a letter of transmittal

listing each paper included, and shall deliver the same to the Architect/Engineer at or before the time of the final inspections. The Contractor is cautioned to check over each bond, receipt, etc., before preparing same for submission to see that the items check with the requirements of the specification.

3.21 DEMOLITION AND SALVAGE:

3.21.1 Where demolition of equipment or materials is required this Contractor shall minimize cutting and exercise all due caution to leave undamaged surfaces, material and equipment meant to remain.

3.21.2 All existing items that are to be removed shall remain the property of the Owner unless declared as unsalvageable. Unsalvageable materials shall become the property of the Contractor and be removed from the site. Items declared as Owner's property shall be neatly stored on the site as directed by the Owner.

3.22 CLOSE OUT CERTIFICATES:

The Plumbing Contractor shall deliver to the Architect/Engineer, prior to or in conjunction with his request for final payment, the original and two (2) copies each of:

Inspection certificates previously herein specified.

Plumbing Contractor's letter of Guarantee.

Equipment manufacturer's warranties, operation and maintenance manuals for pumps, water heaters, faucets, etc.

Certificate of factory representative's check out and start up of the gas water heater.

Affidavit of Payment of Debts and Claims (AIA Form G706).

Affidavit of Release of Liens (AIA Form G706A).

Consent of Surety to Final Payment (AIA Form G707).

Letter certifying that all materials used on this project do not contain asbestos.

3.23 SCHEDULE OF ALTERNATES:

On the Bid Form in the proper locations, state the dollar amounts to be added to or deducted from the Base Bid amount if the alternate bid work is accepted by the owner. Write in the words “Add” or “Deduct” as appropriate along with the amount quoted. Write in the words "No Change" if there will be no change in the Base Bid contract amount if the alternate bid is accepted.

Add Alternate #1- Construct 1000 sq.ft. Tire Storage Building as shown on Sheet S6, A8.0 and PME-1, with 10' wide concrete apron as shown on C2.0.

Add Alternate #2- delete 4" of gravel at Area 1, leaving 2" gravel base. Pave Area 1 (front of Shop) as shown on Civil drawings.

Add Alternate #3- delete 4" of gravel at Areas 1 and 2, leaving 2" gravel base. Pave Area 1 (front of Shop) and Area 2 (side driveways) as shown on Civil drawings.

Add Alternate #4- delete 4" of gravel at Areas 1, 2 and 3, leaving 2" gravel base. Pave Area 1 (front of Shop), Area 2 (side driveways), and Area 3 (back of Shop) as shown on Civil drawings.

END OF SECTION

22 10 00 - PIPING SYSTEMS

PART 1 - GENERAL

1.01 SCOPE:

Work in this section shall include piping, fittings, accessories etc., to be used in piping systems in accordance with the intent of the Contract Documents and shall include the following principal items:

Piping
Valves
Piping Accessories

1.02 REFERENCED STANDARDS:

National Bureau of Standards (NBS).
Cast Iron Soil Pipe Institute (CISPI).
American Society of Testing & Materials (ASTM).
American Water Works Association (AWWA).
National Fire Protection Association (NFPA).
Factory Mutual Engineering Corporation (FM).
American Society of Mechanical Engineers (ASME).

1.03 SUBMITTALS:

Submittals are required as indicated only. Submittal of pipe and fittings is not required unless a deviation from the specification is proposed.

PART 2 - PRODUCTS

2.01 DOMESTIC WATER PIPING (HOT AND COLD):

2.01.1 Domestic water piping 4" or larger size, and exterior to the building, shall be Class 150 AWAA C110 tar-coated cast iron water pipe per ASTM A-377-66. Pipe smaller than 4" shall be Type "K" copper, per ASTM B-88-71 or B-42-71.

2.01.2 Piping, larger than 3", and under the building slab shall be standard weight ductile iron with AWWA approved mechanical gasketed and clamped bell and spigot joints or Type "K" copper, per ASTM B-88. Underground steel piping shall not be allowed for domestic water.

2.01.3 Domestic water piping, 1-1/2" and smaller in size, and under the building slab shall be type "K" soft drawn commercially pure copper water pipe, per ASTM B-88. The use of joints in the piping beneath concrete slabs will be avoided and will be permitted only to the extent of long runs where a single

roll of length of copper tubing is not of sufficient length to complete the piping run. Should a joint be required, the joint shall be made with silver-fos solder and wrought solder joint copper fittings. Pipe larger than 4" shall be Class 150 AWWA C110 tar coated ductile iron water pipe. Pipe 2" to 4" shall be Type-K hard copper per ASTM B-88 with silver-fos solder and wrought fittings.

2.01.4 Domestic water piping, 3" and smaller in size and within the building and above ground, shall be type "L" hard drawn commercially pure copper joint fittings per ASTM B-88 and hard solder. Flux shall be a non-corrosive paste type. Cored solder will not be allowed; all solder shall be a solid string or wire type. Where soldered copper piping must be connected to screwed brass pipe, a cast brass adaptor shall be used. Piping shall be assembled with 95-5 tin/antimony solder or 95-5 tin/silver solder. No solder containing lead shall be used. Foreign made copper piping is prohibited. Solder joints in copper pipe shall be made with 95% tin, 5% antimony solder up to and including 1 ¼" pipe. Use brazing solder for joints in pipes above 1 ¼".

2.01.5 Water piping connections to fixtures or equipment shall be made by use of brass pipe or nipples, chrome plated where exposed to view in finished areas, screwed into copper to IPS adaptor fittings. Ferrous piping connections will not be used in copper piping systems.

2.01.6 Dielectric insulating couplings shall be provided between ferrous and copper piping systems.

2.01.7 Domestic water piping control valves shall be provided by this Contractor where required to adequately control and isolate the various domestic water piping systems. Valves shall be as manufactured by Nibco, Crane, Apollo, Jenkins, American or Grinnel and equal to Nibco numbers as stated below:

A. Gate valves throughout the domestic water piping shall be equal to Nibco solder joint, 125 lb., rising stem double-disc bronze gate valves.

B. Globe valves shall be equal to Nibco, solder joint, 125 lb. brass glove valve.

C. Check valves shall be equal to Nibco, 125 lb., brass check valve with "Buna-N" disc.

D. T& P relief valves shall be ASME rated Watts valve or approved equal.

E. Ball valves shall be equal to Apollo with stainless steel balls.

2.01.8 On each cold supply where serving urinals and/or water closets, provide a manufactured water hammer protective device. These shall be of the size recommended by the manufacturer for the particular application and installed in accordance with Plumbing and Drainage Institute Standard PDI-WH201. Install Access door at each shock arrestor. On all other hot and cold water supplies provide an air chamber the same

size as the supply to the fixture and not less than 24" long. These air chambers shall be located directly behind the supply connection to the fixture and shall have a capped top, shall be constructed of the same material as the piping system in which they are installed, and shall be insulated in the same manner as the balance of the piping system in which they are installed.

2.02 SANITARY DRAINAGE:

2.02.1 All sanitary drainage line (soil, waste and vent) shall be cast iron soil pipe and fittings per ASTM A74-75, coated inside and out and shall be labeled with the C.I. mark of quality and permanence as illustrated in Commercial Standard CS-188-59, which indicates that it complies with this standard. Weight of pipe shall be Class "SV" service weight. Joints shall be fabricated by the use of compression type joints similar to Tyler Pipe and Foundry's "Ty-Seal" with resilient gasketed joint will be acceptable. "No Hub" piping will be acceptable but shall be limited to above ground installation. Any drain line subject to contamination by oil, gasoline, or any other petroleum product shall have "BUNA-N" gaskets, approved for that service.

2.02.2 Horizontal waste, soil pipe and vent shall be given a grade of 1/4" per foot where possible and not less than 1/8" per foot. Where practicable, two or more vents shall be connected together and extended as one vent through the roof. Vent and waste connections to stacks shall be made by the appropriate use of forty-five (45) degrees wyes, long sweep quarter bends, sixth, eight, or sixteenth bends as approved by local codes except that sanitary tees and sanitary crosses shall be used on the connection to vertical stacks. Make vent connections at least 4 feet above floor on which fixture vented is located to prevent use of vent lines as waste. Vent pipe penetrating and extending above the roof shall be 2 inch diameter minimum. Locate vents in roof at least 10 feet from nearest operable window, door, or mechanical equipment.

The Plumbing Contractor shall supply and install weather tight flashing at each point where work installed by the Plumbing Contractor penetrates the roof. Flashing shall be fabricated from four (4) pound per square foot sheet lead. Flashing base collar shall be a minimum of twelve (12) inches wide - vertical sleeves shall extend to the top of the vent stack and terminate under the vent cap as detailed on the contract drawings. Vent caps shall be Zurn Series Z-196-3 or Z-196, Wade Series W-3670 or W-3670-C.

2.02.3 All vents shall be routed to the back side of each roof; at least 10' from air intakes. Vents shall be extended at least 18" above roof and shall be flashed per roofing manufacturer requirements as detailed on drawings.

1. Metal Roof - Use a 1 piece flexible base recommended by the metal roofing manufacturer. The base shall be E.P.D.M. rubber with a ductile aluminum alloy reinforcing base ring bonded to a rubber flange on the base of the flashing unit.

2. Other Roof Types - Use 4 lb. lead with the base extending at least 10" in

every direction from stack. The vertical portion of the flashing shall extend upward. The entire length of the vent pipe shall be turned down inside the pipe at least 2" to provide a weather-tight joint.

2.02.4 Vents of 1-1/2" in nominal size or smaller shall be made by the use of Schedule 40 galvanized steel pipe joined with galvanized, screwed, malleable iron fittings per ASTM A-120-55 or type "M" or "DWV" hard drawn copper pipe per ASTM B-88, assembled with cast copper fitting, joined as specified under "Domestic Water Piping".

2.02.5 Cleanouts shall be provided at each change in direction of the soil lines, at the end of each continuous waste line, at the foot of each riser within the building and at 50'-0" intervals on 3" waste lines and 75'-0" intervals on 4" waste lines in long horizontal lines except as noted. The sizes of cleanouts shall be identical with the size of soil or waste lines in which they are placed, except that cleanouts larger than four inches (4") in diameter will not be required. Cleanouts must be placed in accessible locations and where they occur in pipe chases, said cleanouts shall be placed above the floors in such a manner that they will be accessible through doors or they shall be brought through the wall and provided with flush covers. Exact locations of each shall be approved by the Architect before installation. All cleanouts shall be of the type specifically designed for installation in the type of wall in which they are installed. Wherever cleanouts shall occur in finished floors, they shall be specifically designed for the type of floor in which they are installed. All cleanouts located in exterior locations shall be encased in 14" x 14" x 6" concrete pads unless installed in a walk drive or other paved area. All cover plates on cleanouts shall be attached with vandal-proof screws.

2.02.6 Each fixture and piece of equipment requiring connection to the sanitary drainage system, except fixtures with integral traps, shall be equipped with a trap. Each trap shall be placed as near to the fixture as possible and no fixture shall be double trapped unless permitted by governing codes.

2.02.7 Hub drains and floor drains connected to the sanitary drainage system shall be provided with deep seal P-traps.

2.03 THE CONTRACTOR MAY AT HIS DISCRETION USE P.V.C. - D.W.C. SCHEDULE 40 PIPE IF APPROVED BY LOCAL AUTHORITY/OWNER.

2.03.1 PVC Schedule 40 Solid Wall Pipe and DWV Fitting System:

Pipe and fittings shall be manufactured from PVC compound with a cell class of 12454 per ASTM D 1784 and conform with National Sanitation Foundation (NSF) standard 14. Pipe shall be iron pipe size (IPS) conforming to ASTM D 1785 and ASTM D 2665. Fittings shall conform to ASTM D 2665.

All pipe and fittings to be produced by a single manufacturer and to be installed in accordance with manufacturer’s recommendations and local code requirements. Testing with compressed air or gas may result in injury or death. Solvent cements

shall conform to ASTM D 2564. Primer shall conform to ASTM F 656. The system to be manufactured by Charlotte Pipe and Foundry Co. and is intended for non-pressure drainage applications where the temperature will not exceed 140°F.

2.04 CONDENSATE DRAIN PIPING AND WATER HEATER RELIEF PIPING:

Condensate drain piping and water heater relief piping 1" and smaller shall be type "L" hard drawn copper piping with cast and/or wrought copper fittings per ASTM B-88, 95/5 solder.

2.05 PIPING ACCESSORIES GENERAL:

2.05.1 Flanges shall be slip-on or butt welding standard weight 1/16" raised face type with gaskets.

2.05.2 Unions shall be all bronze for copper systems and malleable iron with ground joint for steel piping systems. Provide dielectric unions for joining dissimilar metallic piping systems.

2.05.3 Weldolets and threadolets shall be steel per ANSI B16.9.

2.05.4 Escutcheons shall be single piece, set screw type, chrome plated and shall cover the opening and sleeve.

2.06 THERMOMETERS, PRESSURE GAUGES AND TEST PLUGS:

2.06.1 Provide thermometers and pressure gauges where shown on drawings and where required for testing and balancing system. The instruments shall be of the same manufacturer throughout.

2.06.2 Pipe thermometers <S> shall be adjustable angle type equal to Weksler type AA5, with separable socket. Thermometers shall have cast aluminum cases with baked enamel finish, red reading mercury tubes with black scale graduations, and glass covers. Scales shall be a minimum of 9 inches with appropriate ranges for indicating temperatures at least 25% above and below normal readings Sockets shall have stem length suitable for pipe receiving thermometer. Sockets on insulated pipes shall have lagging extensions of adequate length to clear insulation.

Acceptable manufacturers: Marsh, Trerice, Weksler

2.06.3 Pressure gauges <S> shall be bourdon tube with minimum accuracy 1.5% of full scale, equal to Weksler type CA1. Gauges shall have direct mounting aluminum cases, not less than 4-1/2" dials, black scale graduations, and glass cover. Scales shall have a minimum arc of 260 degrees with appropriate ranges for indicting pressures at least 25% above normal operating range.

Gauges shall be installed with 1/4", 250 psi brass tee handle cocks, equal to Weksler type A10, and filter type pressure snubbers, equal to Weksler type BW42. Provide pigtails for pressure gauges in steam service.

Acceptable manufacturers: March, Trerice, Weksler

PART 3 - EXECUTION

3.01 PIPING INSTALLATION:

3.01.1 The piping systems required under the Plumbing division of these specifications shall be installed in a neat and workmanlike manner. All pipe hangers shall be of the type mentioned in this section and shall be so spaced and installed as to maintain a rigid piping system, adequately supported both laterally and vertically.

3.01.2 All domestic piping systems shall be installed level and the low points of all risers shall have gate valves 1/2" in size installed with hose ends in order to adequately drain the system.

3.01.3 At each group of plumbing fixtures and at each piece of equipment, gate valves shall be furnished and installed by this Contractor so that these groups of fixtures or pieces of equipment may be isolated from accessible locations. Provide General Contractor with locations of all access doors. Access doors required for these valves shall be furnished by this Contractor.

3.01.4 Each of the piping systems shall be installed to provide for expansion and contraction and the joints shall be soldered at such time that the system is not under strain.

3.01.5 Necessary spring pieces and offsets shall be furnished by this Contractor as required.

3.01.6 Each of the piping systems shall be concealed in chases and above ceilings and in walls in all finished areas and shall be run exposed only as specifically specified or as shown on the drawings in machinery spaces or unfinished areas.

3.01.7 Exposed piping shall be held close to the walls and ceilings and necessary fittings shall be provided and installed to allow for offsets to hold the piping close to wall and ceilings.

3.01.8 All valves shall be so located as to make the removal of their bonnets possible. All flanged valves shown in the horizontal positions shall be mounted with valve stem inclined one bolt hole above the horizontal lines shall be "made-up" with valve stem inclined at an angle of thirty (30) degrees above the horizontal position. All valve stems must be true and straight at the time the system is tested for final acceptance.

3.01.9 Pipe shall be cut accurately to measurements established at the site and worked into place without springing or forcing.

3.01.10 Provide clearance for installation on insulation and for access to valves, drain and unions.

3.01.11 Provide a 1/2" thick foam plastic insulating sleeve-protector on all copper and plastic piping penetrations of concrete slab-on-grade prior to pouring of concrete.

3.01.12 Locate and suspend piping in such a manner so as to minimize transmission of vibration and noise.

3.01.13 All piping penetrations through fire rated ceilings, walls or floors shall be fire stopped using approved materials to maintain the fire rating of the ceiling, wall or floor structure.

3.01.14 All piping connections to equipment and fixtures shall contain flanges or unions to allow easy removal whether or not shown on the plans.

3.02 PIPING JOINTS:

3.02.1 Screwed joints shall have full cut pipe threads. Joints shall be assembled with an approved compound applied to only the male threads. A minimum of three pipe threads shall remain exposed when the joint is assembled.

3.02.2 Mechanical coupling joints shall be assembled in strict accordance with the recommendations of the coupling joint manufacturer. The bolts, fasteners, gaskets and lubricants shall be a product of, or shall adhere rigidly to, the specification requirements of the joint manufacturer.

3.02.3 Solder joints shall be assembled with square cut pipe using a pipe cutter. Hack saw cut pipe ends shall be reamed to full size. Both the pipe and fittings shall be furnished absolutely clean. Brazing flux shall be applied to both the pipe and the fittings. The use of corrosive acid flux will not be permitted. During the brazing, the pipe and fittings must be charged with nitrogen gas.

3.03 SECURING AND SUPPORTING OF PIPE:

3.03.1 All pipe shall be supported from the building structure by means of approved hangers and supports. Piping shall be supported to maintain required grade and pitch, prevent vibration and provide for expansion/contraction.

3.03.2 All hangers shall be secured to approved inserts wherever possible and practicable. Hanger inserts shall be set in place before concrete is poured. Where hangers attach to the structural steel framing, approved beam clamps shall be employed.

Where required, the contractor shall install channels to span between framing members. In no case shall spacing of hangers be greater than indicated on the following schedule:

FERROUS (SCHEDULE 40) PIPING

NOMINAL PIPE SIZE (MAXIMUM)	HANGER SPACE
1/2"	5'-0"
3/4"	6'-0"
1"	7'-0"
1-1/2"	8'-0"
2" to 2-1/2"	10'-0"
3" to 6"	12'-0"

COPPER (WATER TUBE) PIPING

NOMINAL PIPE SIZE (MAXIMUM)	HANGER SPACE
Up to 3/4"	6'-0"
1" to 1-1/2"	8'-0"
1-1/2" to 2"	10'-0"
Larger than 2"	12'-0"

CAST IRON PIPING

NOMINAL PIPE SIZE (MAXIMUM)	HANGER SPACING
All pipe sizes	One hanger per joint in pipe and not exceeding 5'-0" O/C

3.03.3 Vertical lines shall be adequately supported at their bases, either by a suitable hanger placed in the horizontal line near the riser, or by a base fitting set on a pedestal or foundation and from each floor slab by means of approved clamp type support bearing or the slab or beam.

3.03.4 Hangers for piping 2" and smaller shall be of the split cast ring type with fastening device. Hangers for piping larger than 2" shall be of the adjustable clevis hanger type. Hanger rods shall be minimum 3/8" diameter and shall have machine threads. Brackets of approved type may be used along walls. Hanger rods for individually suspended horizontal pipes shall be steel rods of size indicated on the following table:

NOMINAL PIPE SIZE (MAXIMUM)	ROD SIZE
1/2" to 2"	3/8"
2-1/2" to 3"	1/2"
4"	5/8"

5" to 6"	3/4"
8" to 12"	7/8"

3.03.5 Hangers for use with copper piping shall be copper plated ferrous sizes for copper tubing.

3.03.6 Hangers shall be installed within 2'-0" of each change in direction, either vertical or horizontal, or pipe tee and on each side of valves, strainers, etc.

3.03.7 Multiple horizontal pipes, smaller than 12" diameter pipe, may be supported on trapeze hangers. Trapeze spacing shall be in accordance with the schedule for pipe spacing based upon the smallest pipe. The trapeze members shall be properly sized for the piping load they are to support.

3.03.8 Where "cold" pipes are insulated with a vapor sealing jacket, the hanger shall be oversized accordingly to accommodate the outside diameter of the insulation, and half-round 16 gauge galvanized steel shields, not less than 14" long, rolled to fit the insulation diameter, shall be provided between the insulation and the hanger.

3.03.9 Pipe supports shall be as manufactured by Michigan Hanger, Grinnel, or F&S Manufacturing.

3.04 SCHEDULE OF PLUMBING BRANCHES:

The size of branches or runouts to each fixture shall be as indicated on the drawings. Where no size of connection is indicated, connection shall be not less than in accordance with the following schedule or local plumbing code:

Fixture	Waste	Vent	C.W.	H.W.
Water Closet	4"	2"	1"	---
Lavatories	2"	1-1/2"	1/2"	1/2"
Urinals (Wall Mtd)	2"	1-1/2"	3/4"	---
Sinks	2"	1-1/2"	1/2"	1/2"
Mop and Service Sinks	3"	2"	1/2"	1/2"
Floor Drains	4"	2"	---	---
Hose Bibbs	---	---	1/2"	---
Drinking Fountains	2"	1-1/2"	1/2"	---

3.05 EQUIPMENT PLUMBING CONNECTIONS:

3.05.1 The Plumbing Contractor shall rough-in for connections to all miscellaneous equipment noted on the drawings. Final connections to the equipment shall be a part of

this contract.

3.05.2 The Plumbing Contractor shall make final connections to all pieces of equipment furnished under this contract that require natural gas, water, drain, waste or vent connections, furnishing all required shutoff cocks, valves, drain valves and traps.

3.06 TESTING REQUIREMENTS:

Refer to sections 22 40 80 for further testing requirements.

END OF SECTION

22 40 60 - PLUMBING FIXTURES, EQUIPMENT AND DRAINS

PART 1 - GENERAL

1.01 GENERAL:

Refer to Section 22 00 10 for General Requirements for mechanical work.

1.02 SCOPE OF WORK:

1.02.1 Furnish and install all labor, materials, equipment, tools and services and perform all operations required in connection with or properly incidental to the installation of complete plumbing fixtures and plumbing equipment, as indicated on the drawings, reasonably implied therefrom, or as specified herein, unless specifically excluded.

1.02.2 Plumbing fixtures shall be supplied, set and connected as listed herein and as shown on the drawings. Fixtures shall be protected from damage during construction and shall be thoroughly cleaned of all tape and adhesive prior to final acceptance.

1.02.3 Special mounting heights of plumbing fixtures shall be coordinated with architectural details of each toilet area.

1.03 SUBMITTALS:

Submittals are required as indicated.

1.04 REFERENCE STANDARDS:

North Carolina State Plumbing Code
Local City/County Plumbing Code

PART 2 - PRODUCTS:

2.01 FITTINGS AND PIPES:

2.01.1 Fittings and piping in connection with plumbing fixtures shall be brass and, wherever exposed, shall be polished, chrome-plated. Provide tight fitting wall or floor escutcheons of chrome-plated brass wherever pipes pass through walls, floors and ceilings.

2.01.2 Furnish and install all required water, waste, soil and vent connections to all plumbing fixtures and equipment, together with all fittings, supports, fastening devices, cocks, valves, traps, etc., leaving all in complete working order.

2.02 FIXTURES:

2.02.1 All plumbing fixtures shall be new, first quality, free from marks or chips and shall be furnished with sufficient support in order to adequately hang each and every unit.

2.02.2 Each and every unit shall be complete with all required trim and all exposed piping and trim shall be polished chrome-plated, all brass. Each and every fixture shall be furnished with stop valves whether specifically shown and/or specified or not, and all such stop valves shall have a metal-to-metal seat.

2.02.3 Each piece of trim, supply fittings, etc., shall be furnished whether correctly specified or not in order to securely fit the fixture involved to the particular roughing-in available.

2.03 PLUMBING FIXTURES: <S>

See drawings for fixture specifications.

2.04 CLEANOUTS: <S>

2.04.1 CLEANOUTS SHALL BE AS FOLLOWS:

Floor Cleanouts - in finished areas - Zurn #ZN-1400-T with Square nickel bronze top

- in tile floors - Zurn #ZN-1400-T
- in terrazzo floors - Zurn #ZN-1400-Z
- in carpeted floors - Zurn #ZN-1400-CF

Wall Cleanouts - Zurn #Z-1441 with Stainless Steel coverplate

Cleanouts in exposed piping - Zurn #ZN-1440

Exterior cleanouts - Zurn #Z-1400 w/nickel bronze top

2.04.2 Cleanouts in waterproof floor shall have flashing flange and clamping device.

2.04.3 Cleanouts in carpeted areas shall be provided with carpet markers.

2.05 WATER HAMMER CONTROL: <S>

2.05.1 Arrestors shall be sized and applied in accordance with the Plumbing and Drainage Institute Standard PDI-WH-201. Equipment equal to Zurn #Z-1700 or equal by Amtrol, Wade, Sioux Chief or Smith is acceptable.

2.05.2 Provide access cover in wall to service water hammer arrestors.

2.06 VACUUM BREAKERS: <S>

2.06.1 For hose bibb, sill cock, yard hydrants, and wall faucets: Woodford #34H, or equal by Watkins or Watts.

2.06.2 For water heaters without dip tubes: Watts #288A or equal by Watkins or Watts.

2.07 <S> DOMESTIC HOT WATER CIRCULATORS:

Hot water circulating pumps shall be manufactured by Bell and Gossett, Taco or Thrust and shall have capacities as scheduled on the drawings. The pumps shall be all bronze construction and shall be furnished complete with a manual motor starter equal to Square "D" Class 2510.

2.08 <S> REDUCED PRESSURE ZONE (RPZ) BACKFLOW PREVENTER:

A Reduced Pressure Zone Assembly shall be in stalled at each cross-connection to prevent back siphonage and backpressure of hazardous materials into the potable water sup ply. The assembly shall consist of a pres sure differential relief valve located in a zone between two positive seating check valves. Back siphonage protection shall include provision to admit air directly into the reduced pressure zone via a separate channel from the water discharge channel, or directly into the supply pipe via a separate vent. The assembly shall include two tightly closing shutoff valves before and after the assembly, test cocks and a protective strainer upstream of the No. 1 shutoff valve. The assembly shall meet the requirements of ASSE Std. 1013; AWWA Std. C-511-92 CSA B64.4; FCCCHR of USC Manual Section 10. Listed by IAPMO (UPC). SBCCI (Standard Plumbing code).

PART 3 - EXECUTION:

3.01 INSTALLATION:

3.01.1 Plumbing fixtures and equipment shall be set in place, leveled and connected as indicated on the drawings. Fixtures shall be protected from damage during construction and shall be thoroughly cleaned of all tape and adhesive prior to final acceptance.

3.01.2 Verify exact location and mounting height of wall hung and handicapped fixtures with architectural drawings before roughing-in.

3.01.3 Contractor shall set and connect all fixtures, including fixtures and equipment furnished by others, in strict accordance with the manufacturer's printed instructions and applicable industry standards as indicated.

3.01.4 Caulk around wall mounted fixtures with fine continuous bead of white silicon sealant.

3.01.5 Supplies to each fixture or piece of equipment shall be valved for service.

3.01.6 All drains shall be trapped and vented.

3.01.7 Connection between china and soil pipe flanges shall be made gas and water-tight with one-piece molded gasket.

3.01.8 Do not install aerators on faucets until system has been flushed out and sterilized.

3.01.9 Provide china bolt caps for water closet mounting studs.

END OF SECTION

22 40 70 - INSULATION

PART 1 - GENERAL

1.01. GENERAL:

Refer to Section 22 00 10 for General Requirements for mechanical work.

1.02 SCOPE OF WORK:

The Contractor shall cover all piping and apparatuses, as specified below, with insulation as manufactured by Johns-Manville, Owens-Corning, Armstrong, Imcoa or approved equal. All insulation, jacket, facing and adhesive shall have composite ratings not exceeding flame spread of 25 and smoke development of 50. All pipe insulation shall meet all requirements of the International Energy Code.

PART 2 - PRODUCTS:

2.01 DOMESTIC HOT AND COLD WATER PIPING:

2.01.1 All hot and cold water piping shall be insulated using a molded pipe insulation with a factory applied all-service jacket (ASJ) and two-component adhesive closure system sized to fit the piping. The circumferential joints shall be sealed with butt strips that are compatible with ASJ facing. The minimum thickness of the insulation shall be 1” or as required by the NC Energy Conservation Code, 2009 Edition. This insulation material shall be a "Universal" white all service jacket with flap. All hot and cold water piping 1-1/4" and larger shall be insulated 2" fiberglass.

Fittings and valves shall be insulated with pre-formed fiberglass fittings and finished with PVC fitting covers. The fittings shall be insulated as prescribed above, jacketed with preformed fitting covers matching outer jacketing used on straight pipe sections, with all joints sealed.

Hot water piping under floor-on-grade shall be insulated with insulation to meet the requirements of the NC Energy Conversation Code and the NC Plumbing Code, 2012 Edition. Cold water piping under floor-on-grade and within three foot (3') of an exterior wall shall be insulated with insulation to meet the requirements of the NC Plumbing Code and the NC Energy Conversation Code, 2012 Edition.

2.01.2 Thermal insulation shall be applied with a minimum of joints with particular attention to longitudinal joints. All joints shall be tightly butted and carefully adhered with approved adhesive as recommended by the insulation manufacturer. Adhesive shall be applied to the entire joint surface so that the resultant finished joint, both butt and longitudinal, is free of voids.

2.02 CONDENSATE DRAIN PIPING:

All condensate drain piping including sewer mains carrying condensate from air conditioning units that runs outside of fan housing shall be insulated with 1/2" thick molded fiberglass with a "Universal" white vapor barrier jacket with flap. Furnish manufacturer rigid fitting covers.

PART 3 - EXECUTION:

3.01 PROCEDURES:

3.01.1 All piping insulation shall be the product of reputable manufacturers and shall be applied and installed by an independent contractor engaged in the insulating business. The materials shall all be applied in accordance with the published standards of the manufacturer of the materials, using any special materials as required by these specifications and by those published standards. Unsightly work shall be just cause for rejection.

3.01.2 All sectional covering shall finish round and smooth, without lumps or depressions and all end and joints shall butt evenly and tightly together and to the covered surface. No broken or damaged section shall be used. When covering is formed from blocks, they shall be carefully and evenly applied, securely wired in place and joints shall be closed with cement insulation.

3.01.3 In instances where insulated lines pass into other areas, wherein the line will not be insulated as described herein, the insulation shall not terminate at the wall, but shall extend full size a minimum of 1" beyond the wall.

3.01.4 Engage the services of a qualified insulation applicator to furnish and install all the insulation required for the mechanical equipment, piping, etc., specified herein.

3.01.5 All surfaces to be insulated shall be clean and dry before applying insulation. All sections of molded pipe covering shall be firmly butted together. No insulation shall be applied until the pipe, duct, etc., have been pressure tested and found tight. Piping flexible connections, flanges and unions shall not be covered unless specifically noted. Flexible connections on ducts shall not be covered.

3.01.6 Prior to the installation of any insulating material to ferrous piping systems, the piping surfaces shall be thoroughly cleaned of all mill scale, grease and dirt and shall be given a coat of rust inhibiting primer.

3.01.7 Refer to Section 22 00 10, for flame spread properties of insulating materials.

3.01.8 Where vapor barriers are required, the vapor barrier shall be on the outside. Extreme care shall be taken that the vapor barrier is unbroken. Joints, etc., shall all be

sealed. Where insulation with a vapor barrier terminates, it shall be sealed off with the vapor barrier being continuous to the surface being insulated. Ends shall not be left raw.

3.01.9 All insulation exposed to the weather shall be coated with a weatherproof finish recommended by the manufacturer and contain an aluminum metal jacket.

3.01.10 Insulation shall be slid on unslit or shall be applied with contact cement. Duct tape, electrical tape, staples, etc., shall not be permitted.

3.01.11 Metal jackets shall have side and end lap at least 2-inches wide with the cut edge of the side tap turned inside one inch to provide a smooth edge. Overlap the jacket not less than 2 inches at longitudinal and circumferential joints and secure with metal bands at not more than 9-inch centers or with screws at not more than 5-inch centers. Overlap longitudinal joints down to shed water. Seal circumferential joints with a coating recommended by the insulation manufacturer for weatherproofing.

3.01.12 Materials containing asbestos shall be prohibited.

END OF SECTION

22 40 80 - CLEANING AND TESTING

PART 1 - GENERAL:

1.01 GENERAL:

1.01.1 Refer to Section 22 00 10 for General Requirements for Mechanical Work.

1.02 SCOPE OF WORK:

1.02.1 This Contractor shall, at his own expense, during the progress of the work or upon its completion, make such tests of his work as are herein specified in accordance with all laws, governing authorities, or as are required by Engineer or by state or municipal bureaus having jurisdiction and under their supervision. The Contractor shall provide all apparatus, temporary piping connections or any other requirements necessary for such tests. He shall take all due precautions to prevent damage to building or its contents incurred by such tests, as he will be required to repair and make good, at his own expense, any damage so caused. Any leaks, defects or deficiencies discovered as a result of the tests shall be immediately repaired or made good and test shall be repeated until the test requirements are full complied with. No caulking of pipe joints to remedy leaks will be permitted.

1.02.2 No work of any nature shall be covered, enclosed or otherwise concealed until properly inspected, tested and approved. Any leaks which develop during any of the tests shall be corrected with new material and made as good as required; said tests shall be repeated until the work is satisfactory to Engineer and the mechanical inspectors in every way.

1.02.3 Each separate system with its various components shall be operated by this Contractor for a reasonable length of time to demonstrate the performance of all equipment and piping in accordance with the true intent and purpose of the plans and specifications. All necessary adjustments shall be made to the satisfaction of the Engineer.

1.02.4 All motor driven equipment shall be proved operable generally in accordance with the intent of these specifications.

1.02.5 All electrical power and water for testing of air conditioning and/or heating equipment and plumbing systems shall be provided by the General Contractor.

PART 2 - PRODUCTS

2.01 STERILIZATION MATERIALS:

Domestic water sterilization solutions shall contain not less than 50 parts per million of

available chlorine. The chlorinating materials shall be either liquid chlorine, conforming to U. S. Army Specification Number 4-1, or calcium hypochlorite or chlorinated lime conforming to the requirements of Federal Specification 0-C-114.

PART 3 - EXECUTION

3.01 TESTING AND ADJUSTING:

3.01.1 Water Piping System: Water piping systems shall be properly tested to a hydrostatic pressure of one hundred and fifty pounds per square inch gauge (150 psi) for a period of not less than eight hours. During this test period, all leaks in pipe, fittings and accessories, and in the particular piping system which is being tested, shall be stopped and the hydrostatic test shall again be applied. This procedure shall be repeated for an entire eight hour period and no leaks can be found while the system being tested is subject to the pressure mentioned above.

3.01.2 Sanitary and Storm Drains: Pipe shall have all outlets temporarily plugged. The pipes shall be filled with water testing the system in sections such that no section shall be tested with less than 10 foot (10') head of water. If after twenty-four (24) hours, the level of the water has been lowered by leakage, the leaks must be found and stopped by this Contractor, and the water level shall again be raised and the test repeated until after twenty-four hour retention period there shall be no perceptible lowering of the water level of the system being tested.

3.02 STERILIZATION:

3.02.1 After completion of the testing, the entire domestic cold and hot water piping systems with attached equipment shall be thoroughly sterilized with a solution containing not less than 50 parts per million of available chlorine as described above. The chlorinating materials shall be pumped into the system through the connection described below. The sterilization solution shall be allowed to remain in the system for a period of eight (8) hours, during which time all valves and faucets shall be opened and closed several times. After sterilization, the solution shall be flushed from the system with clean water until the residual chlorine content is not greater than 0.2 parts per million. The exact procedure actually used shall meet or exceed local code requirements.

3.02.2 The sterilization solution shall be introduced into the water system through a 3/4" opening to be provided in the water main on the house side of the water meter.

3.02.3 The sterilization process shall be conducted under the direction of the local health department and upon completion of the process, the health department shall test and verify the cleanliness of the water piping system.

END OF SECTION

22 80 65 – AIR AND OIL REELS

PART 1 - GENERAL

1.1 Scope:

A. Related Work Specified Elsewhere:
   1. Coordinate work of this Section with General Requirements in Division 1.
   2. Compressed air system components (Section 22 80 80)
   3. Oil supply pumps (Section 22 80 70)

PART 2 - PRODUCTS

A. LOW PRESSURE HOSE REELS: Quality standard model D8850-OLP as manufactured by Reelcraft Industries, Inc. of Columbia City, Indiana. Hose I.D. 1/2", hose O.D. .844", 50' length as scheduled on drawings. For air and water only. Approved equal by Aro Corp. or Lincoln.

B. MEDIUM PRESSURE HOSE REELS: Quality standard model D8850-OMP as manufactured by Reelcraft Industries, Inc. of Columbia City, Indiana. Hose I.D. 1/2", hose O.D. .815", 50' length as scheduled on drawings. For oil only. Approved equal by Aro Corp. or Lincoln.

PART 3 - INSTALLATION

A. Installation shall be by skilled workmen and shall be in strict accordance with manufacturer's standards.

B. Guarantee of parts and workmanship for a period of not less than one year.

END OF SECTION

22 80 70 - OIL SUPPLY PUMPS

PART 1 - GENERAL

1.1 Scope:

A. Related Work Specified Elsewhere:
   1. Coordinate work of this Section with General Requirements in Division 1.

PART 2 - PRODUCTS

2.1 A. 30 weight oils supply pump ARO Model #662008_E 55 gallon, 3" air motor, 2 1/4 stroke.
B. 90 weight oil supply pump ARO Model #612117-D 16 gallon, 3" air motor, 2 1/4 stroke.
C. Hydraulic fluid supply pump ARO Model #612117-D 16 gallon, 3" air motor, 2 1/4 stroke.

2.2 ACCESSORIES:

A. Provide couplers, quick connectors, air hoses, material hoses, barrel covers and all other items required for a complete system.
B. Provide a cut-off valve at each supply pump and at each tubing connection to each reel.
C. Provide one model #128241-300 combination air filter/regulator/lubricator at each supply pump.

2.3 Accepted equals to ARO Products are Grover and Lincoln, subject to Owner's approval.

PART 3 - INSTALLATION

A. Installation shall be by skilled workmen and shall be in strict accordance with manufacturer's standards.
B. Guarantee of parts and workmanship for a period of not less than one year.

END OF SECTION

22 80 75 - AUTOMOTIVE OIL CONTROL HANDLES

PART 1 - GENERAL

1.1 Scope:

A. Related Work Specified Elsewhere:

1. Coordinate work of this Section with General Requirement in Division 1.

PART 2 - PRODUCTS

2.1 A. 30 weight oil control handle, ARO Model #635383, one quart metered control nozzle.

B. 90 weight oil control handle, ARO Model #635381, one pint metered control nozzle.

C. Hydraulic fluid control handle, ARO Model #635392 with built-in swivel, filter and right angle tip.

2.2 Accessories:

A. Provide quick connects at each control handle location.

2.3 Accepted equals are Grover and Lincoln, subject to Engineer's approval.

PART 3 - INSTALLATION

A. Installation shall be by skilled workmen and shall be in strict accordance with manufacturer's standards.

Guarantee of parts and workmanship for a period of not less than one year.

END OF SECTION

22 80 80 - COMPRESSED AIR SYSTEM COMPONENTS

PART 1 - GENERAL

1.1 Scope:

A. Related Work Specified Elsewhere:
   1. Coordinate work of this Section with General Requirements of Division 1.
   2. Oil supply pumps (Section 22 80 70)
   3. Air piping

PART 2 - PRODUCTS

A. Air compressor to be provided by the Owner. Plumbing contractor is responsible for installation and piping to his equipment.
B. Air compressors to be set on vibration isolator pads to be approved by Owner.
C. Between air compressor and main air line there shall be a braided flex hose. This hose shall be at lease the same size as the main air line and shall be designed to accept at least 200 psi in pressure.
D. Galvanized-Steel Pipe and Fittings
   A. Galvanized-Steel Pipe:
      1. ASTM A 53/A 53M, Standard Weight.
      2. Include ends matching joining method.
   B. Galvanized-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106/A 106M, Standard Weight, seamless steel pipe with threaded ends.
   C. Galvanized, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
   D. Malleable-Iron Unions:
      1. ASME B16.39, Class 150.
      2. Hexagonal-stock body.
      3. Ball-and-socket, metal-to-metal, bronze seating surface.
      4. Threaded ends.
   E. Flanges: ASME B16.1, Class 125, cast iron.

PART 3 - INSTALLATION

A. Installation shall be by skilled workmen and shall be in strict accordance with manufacturer's standards.
B. Guarantee of parts and workmanship for a period of not less than one year.

END OF SECTION

23 - MECHANICAL

SECTION 23 00 10 - GENERAL PROVISIONS

PART 1 - GENERAL

1.01 SCOPE:

The scope of the mechanical phase of this project shall include all labor, materials, equipment, etc., required to fulfill the intent of the Contract Documents and shall include the work specified under the subsequent sections of Division 26 of these specifications.

1.02 RELATED DOCUMENTS:

All applicable provisions of General Conditions, Supplement to General Conditions and General Requirements, Division 1 govern work under this Division. Refer to these articles in the specifications for additional information.

1.03 REFERENCE STANDARDS:

1.03.1 All work shall be performed in full accord with the latest editions of the applicable state and national building codes.

1.03.2 Refer to each section for applicable codes and reference standards.

1.04 FEES, PERMITS AND TAXES:

This Contractor shall give all notices, obtain and pay for all permits required by local authorities.

1.05 SUBMITTALS:

1.05.1 The symbol "<S>" indicates a requirement for submittals.

1.05.2 Refer to General Conditions of the contract.

1.05.3 In addition to the requirements of the above referenced portions of this specification, all Subcontractors proposing to do work under this Division shall comply with the following additional requirements:

A. These specifications and drawings are intended to indicate a standard of quality for materials and equipment which is established by the listing of manufacturers' names and catalog numbers and/or by referenced standards. Materials and equipment that do not comply with these standards of quality will not be considered for substitution.

B. As soon as practicable and within twenty (20) days after the award of the contract and

before beginning the fabrication of any material or the installation of any equipment, data shall be submitted for approval on equipment and materials where noted. Materials (pipe, fittings, etc.) may be listed with the name of the manufacturer and identifying catalogue numbers. Data for equipment shall include manufacturer's name, catalogue data, diagrams, drawings and other descriptive data as required or requested by the Engineer for evaluation.

C. Notwithstanding any reference in the specifications to any article, device, product, material, fixture, form or type of construction by name, make or catalogue number, such references shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition; and the Contractor, in such cases, may at his option use any article, device, product material, fixture, form or type of construction which in the judgment of the Engineer expressed in writing, is equal to that specified.

D. All data shall be carefully examined and shall be forwarded for approval with a signed certification to the effect that the data has been carefully checked and found to be correct with respect to dimensions and available space and that the equipment complies with all requirements of the specifications.

E. Point out in writing all deviations between the plans and specifications and the materials submitted.

F. It is understood that proof of equality is the responsibility of the Contractor and/or supplier and that it is not the responsibility of the Engineer to prove the inequality of the proposed substitutions Furthermore the decisions of the Engineer is final.

1.05.5 While it is not the intention of the Engineer to discriminate against any manufacturer of equipment which is equal to specified equipment, a strict interpretation of such equality will be exercised by the Engineer in considering any equipment offered as a substitute for equipment named in the specification It shall be the responsibility of the Contractor to submit with each request for approval of substitute material or equipment, sufficient data to show conclusively that it is equal to the material or equipment specified.

1.05.6 Each Contractor shall submit shop drawings and/or diagrams for approval and for job coordination in all cases where significant deviations from the contract drawings are contemplated because of job conditions, interferences, or substitutions of equipment, or when requested by the Engineer for purposes of clarification of the Contractor's intent. He shall also submit detailed shop drawings, rough-in sheets, etc., for all special or custom built items of equipment.

1.05.7 Submittal of shop drawings shall be made in sufficient copies to provide one (1) copy of all data to be retained by the Engineer; two (2) copies of all data to be accumulated for the Owner; one (1) copy of all data to be retained by the Contractor.

1.05.8 Should any substitute items be submitted and disapproved, then those items must be furnished exactly as described herein.

1.05.9 The Engineer's review of shop drawings and/or submittal data shall not relieve the Contractor of responsibility for deviations from the contract drawings or specifications.

1.05.10 The size of mechanical equipment shown on the drawings is based on the dimensions of a particular manufacturer. While other manufacturers may be acceptable, it is the responsibility of the Contractor to determine if the equipment he proposes to furnish will fit in the space. Shop drawings shall be prepared when required by the Engineer or Owner to indicated a suitable arrangement.

1.05.11 One quarter (1/4) inch scale reproducible shop drawings shall be prepared and submitted for approval to indicate a suitable arrangement in all mechanical rooms, to include but not limited to piping, fittings and valves, equipment and accessories. All ductwork shall be drawn double-lined. All drafting shall be done by a qualified draftsperson. The engineer reserves the right to request resumes of drafting personnel or drafting service.

1.05.12 All provisions of this section shall comply with General Statue 133-3, revised and ratified July 13, 1993.

1.06 OPERATING AND MAINTENANCE MANUALS AND INSTRUCTIONS:

1.06.1 The symbol "<OM>" indicates a requirement for operating and maintenance manuals to be furnished.

1.06.2 The Owner's operating personnel shall be instructed by the Contractor on how to start and operate each item of equipment. Safety features shall be pointed out, particularly the possible troubles which might cause the safety controls to operate and what might be done to remedy the trouble.

1.06.3 The Owner's operating personnel shall be thoroughly instructed in the operation of the control system. Instructions should include an explanation of the control system or system sequence of operation, the proper set points of each thermostat, etc., and how to change the settings to accommodate overheating and overcooling, or incorrect humidity. Instructions shall include an explanation of components which should not be tampered with or control settings which should not be changed except by authorized personnel of the Control Manufacturer. Thermostat keys shall be turned over to the Owner.

1.06.4 Relative to the mechanical system, instruct the Owner's operating personnel in the following:

A. Removal of service access panels from equipment. If special tools are required, turn over to the Owner at least one set.
B. Method of removing air filters.

C. Method of cleaning permanent type filters.

D. Location of concealed valves, traps, air splitters, automatic valves and dampers, etc., requiring periodic maintenance and location of access to them.

1.06.5 Provide (4) four copies of operating and maintenance manuals. Manuals shall be bound in large ring, loose-leaf binders and contain the following:

A. Manufacturer's instructions and/or installation manual.
B. Manufacturer's service manual.
C. Manufacturer's lubrication chart listing types of lubricant to be used on each item of equipment and recommended frequency of lubrication.
D. Electrical diagrams of each equipment "packaged" control system.
E. Diagrams of automatic temperature control systems, identifying each by name, location and number showing sequence of operation. Each component of a control system shall be identified. All diagrams shall be up-to-date, reflecting any on-the-job changes.
F. Parts lists and identifying part numbers with prices of each part. The name and address of the nearest distributor from which parts can be obtained.

1.07 WARRANTY

This contractor shall warrant all workmanship, material, equipment systems, etc., provided by him for a period of one year after final acceptance of the project. This warranty means that this contractor shall make good to the Owner, at no cost, any defects that become apparent during the year following substantial completion. This warranty is in addition to any other guarantees or warranties and is not intended to limit such other guarantees or warranties.

1.08 DEFINITIONS: The following words and phrases as used herein are hereby defined:

1.08.1 "provide": Furnish and install all material and labor required for a complete installation ready for operation in accordance with the intent of the Contract Documents.

1.08.2 "as required": Indicates that the Contractor shall perform the work or provide the material as indicated in accordance with manufacturer's installation instructions; and in accordance with applicable codes or regulations; and in a workmanlike manner as defined by good local practice.

1.08.3 "or equal": Indicates that the Contractor may substitute equipment by another manufacturer if the salient features of the equipment indicated by manufacturer's name and/or described are, in the judgment of the Architect and/or Engineer, adequate. Submittals for approval are required where indicated.

1.08.4 "contractor": Where the word(s) "Contractor" or "this Contractor" is/are used, that refer to the Contractor engaged to execute the work under this division of the specifications only, even though he may be technically described as a sub-contractor.

1.08.5 "intent of the Contract Documents": The specific intent of these documents is to provide to the Owner, in a thoroughly functional condition, all the various systems, equipment, etc., indicated herein. Final authority over interpretation of the "intent" shall rest with the Architect.

1.08.6 "shall": Indicates a mandatory requirement.

1.09 INSPECTION OF THE SITE:

1.09.1 The drawings are prepared from the best information available and reflect all conditions commensurate with this information. However, the contractor should visit the site prior to submitting a proposal and should verify the locations, sizes, depths, pressures, etc., of all existing utilities, equipment and structural members and familiarize himself with working conditions, hazards, existing grades, soil conditions, obstructions, etc. If it becomes evident that existing site conditions will impair the proper operation of the utilities or proposed HVAC systems, the Architect/Engineer should be notified in writing.

1.09.2 All proposals shall take these existing conditions and any revisions required into consideration.

1.09.3 The removal of existing ceilings for Mechanical Work is the responsibility of the Mechanical Contractor unless it is specifically stated otherwise elsewhere in these specifications. The Mechanical Contractor shall include in his bid (when the above is applicable) the amount to hire a Ceiling Contractor to remove, safely store (if lay-in) and replace the ceiling upon completion of the Mechanical Work. The Ceiling Contractor shall be licensed, insured and has been in the business of ceiling installation for at least five (5) years. Refer also to the architectural demolition plans.

1.09.4 The cutting and patching of floors and walls for Mechanical Work is the responsibility of Mechanical Contractor unless it is specifically stated otherwise elsewhere in these specifications. The Mechanical Contractor shall include in his bid (when the above is applicable) the amount to hire a Contractor regularly engaged in the repair and finish of such surfaces, including any masonry, painting, tile, hardwood or carpet replacement, to restore damaged areas to match existing adjacent surfaces. The Contractor hired shall be licensed, insured and has been in business for at least five (5) years. Refer also to the architectural demolition plans.

1.09.5 Roofing work shall be the responsibility of the General Contractor. The Mechanical Contractor shall furnish all roof curbs, equipment rails and pipe supports to the General Contractor for installation.

1.10 CONSTRUCTION REQUIREMENTS:

1.10.1 The Contractor shall be responsible for fitting his material and apparatus into the building and shall carefully lay out his work at the site to conform to the structural conditions, to provide proper grading of lines, to avoid all obstructions and to conform to the details of the installation supplied by the manufacturer of the equipment to be installed. Furnish all necessary pilot lines and control lines whether indicated on the drawings or not. The drawings do not give exact details as to elevations of pipe lines nor do they show exact locations of pipe to scale. Piping elevations shall be handled by giving precedence to pipes which require a stated grade for proper operation. Devices necessary for installation and support of pipes, and equipment (such as sleeves, inserts, etc.) shall be located and installed as the construction progresses in order to allow completion of each phase of the work in the proper sequence.

1.10.2 Drawings showing the extent and arrangement of the work of a particular trade shall be used together with drawings showing extent and arrangement of work of other trades to insure that the Contractor in laying out and installing his work shall do so in a manner such that the work of the several trades may progress in the most direct, workmanlike and harmonious manner.

1.10.3 The Contractor shall be responsible for the proper location and size of slots, holes or openings in the building structure pertaining to his work, and for the correct location of pipe sleeves. The drawings indicate the extent and general arrangement of the various systems, but if any departures from these drawings are deemed necessary by the contractor, detailed drawings and descriptions of these departures and a statement of the reasons therefore shall be submitted to the Architect as soon as practicable. No departures from the arrangements shown on the drawings shall be made without prior written approval of Architect.

1.10.4 In general, piping and ductwork in finished areas of the building shall be run concealed unless noted and directed otherwise. Should any conditions arise which would cause any piping or ductwork to be exposed in finished areas, it shall be immediately called to the Architects' attention. In unfinished spaces such as equipment rooms, all pipe and duct shall be run as high as possible, shall be run to a continuous grade and shall be grouped wherever it is feasible to do so.

1.10.5 Equipment shall be installed in such a manner to make oiling devices and parts requiring service and maintenance readily accessible.

1.10.6 All pipe, duct, etc., shall be cut accurately to measurements established at the building and shall be worked into place without springing or forcing. All ducts and pipes run exposed in machinery and equipment rooms shall be installed parallel to the building planes except that the lines shall be sloped to obtain the proper pitch. Piping and ducts run above furred ceilings, etc., shall be similarly installed, except as otherwise shown. All pipe openings shall be kept closed during construction until the systems are closed with final connections.

1.10.7 All trades shall thoroughly acquaint themselves with the details before submitting their bid as no allowance will be made because of unfamiliarity with these details. For new construction, place all inserts to accommodate the ultimate installation of pipe hangers in the forms before concrete is poured and set sleeves in forms before construction. For existing construction, all required inserts shall be "drilled-in" and all openings required through concrete or masonry shall be "saw-cut" or "core drilled" with tools specifically designed for this purpose. Explosive or compression driven inserts shall only be allowed for use as approved by SMACNA and the manufacturer of these devices. All concealed lines shall be installed as required by the pace of the job to precede the general construction.

1.10.8 The mechanical plans do not give exact locations of outlets, fixtures, equipment items, etc. The exact location of each item shall be determined by reference to the general plans and to all detail drawings, equipment drawings, roughing-in drawings, etc., by measurements at the building and in cooperation with other trades. Minor relocations necessitated by the conditions at the site or directed by the Owner shall be made without additional cost to the Owner.

1.10.9 All oiling devices and all parts of equipment requiring adjustment shall be easily accessible. Equipment shall be so located and installed as to permit convenient and safe maintenance and future replacement. The trade furnishing the equipment shall be responsible prior to ordering same in the event that equipment specified and/or approved is incompatible with this requirement.

1.11 SLEEVES:

1.11.1 Refer to General Conditions of the contract.

1.11.2 Each and every pipe and duct, regardless of material, which passes through a concrete slab, (except slab on grade), masonry wall, roof or other portion of the building structure shall be free from the structure and shall pass through a sleeve furnished and installed by the Subcontractor responsible for the work involved.

1.11.3 Above grade and dry location sleeves shall be constructed from schedule 40 steel pipe and shall be flush on both sides of wall surface penetrated. The sleeves shall be sized to allow free passage of the pipe to be inserted, and when this pipe is to be insulated, the sleeves shall be large enough to pass the insulation. Floor sleeves located in pipe chases shall extend up two inches (2") above the floor slab.

1.11.4 Sleeves passing through walls or floors on or below grade and/or in moist areas shall be constructed of galvanized steel, schedule 40 pipe and shall be designed with suitable flange in the center of the floor or wall to form a waterproof passage. After the pipes have been installed in the sleeves, void space around the pipe shall be caulked to insure a waterproof penetration. Fire ratings of rated walls and floors shall be maintained by the use of approved materials.

1.12 ISOLATION

1.12.1 Transmission of perceptible vibration, structure-borne noise, or objectional air borne noise to occupied areas by equipment installed under this contract will not be permitted.

1.12.2 The isolation supplier shall be a firm or individual capable of dealing effectively with vibration and noise characteristics, effects and criteria and have facilities and capabilities for measuring and evaluating such disturbances and the preparation of drawings and installation instructions.

1.13 CONSTRUCTION SAFETY:

This contractor assumes all responsibility regarding the safety of his personnel on the project during construction. The Contract Documents do not include materials, procedures, components, etc., required to insure construction safety. Refer to General Conditions and Supplementary General Conditions for additional information.

1.14 DAMAGE:

1.14.1 This Contractor shall be responsible for damage to project caused by this Contractor's failure to recognize hazards associated with items such as leaks, scheduling of work, inexperienced workmen, excessive cutting, etc.

1.14.2 This Contractor shall repair, at no expense to the Owner, any such damage.

1.14.3 This contractor shall familiarize himself with working conditions to the extent that he shall be responsible for damage to concealed piping, wiring and other equipment to remain and shall repair any damage caused by his negligence at no cost to the Owner.

1.15 FLOOR, CEILING AND WALL PLATES:

1.15.1 Refer to General Conditions of the contract.

1.15.2 In addition to the requirements of the above referenced portions of this specification, all Subcontractors shall furnish a chromium plated sectional escutcheon in each finished space on each pipe or hanger rod penetrating a wall, floor or ceiling. Escutcheons shall be sized to fit snugly to all lines and where the lines are insulated, the escutcheons shall be fit snugly over the insulation. Where required, these plates shall be provided with set screws so that they fit snugly against the finished surface. All equipment rooms are classified as finished space.

1.16 IDENTIFICATION:

1.16.1 Each piece of equipment; every valve whose service and/or duty is not readily apparent; each zone duct, outside air duct and return air duct whose duty is not

immediately apparent; every piping system except cast iron sewer lines, shall be permanently and clearly identified.

1.16.2 Equipment, valves and duct shall be provided with laminated phenolic nameplates, appropriately engraved with proper identification correlated to the designation shown on the drawings. Do not use self-adhesive nameplates to equipment with brass screws. Punched plastic tape will not be acceptable. Insulated equipment may have identification taped on as for piping system.

1.16.3 Piping systems shall have designation on twenty foot (20'-0") centers and closer where required to provide adequate identification, using Brady "all temperature permacode" pipe markers with direction of flow and service indication. Piping systems in mechanical rooms shall be painted and stenciled identifying the system. Color scheme shall be as follows:

Gas Pipe - Yellow

1.16.4 All these pipe markers shall conform to ANSI-A-13 "Scheme for the Identification of Piping Systems". Arrow markers must have the same ANSI background colors as their companion pipe markers. All marks shall be as manufactured by Brady or approved equal.

1.16.5 Contractor shall obtain written approval of proposed identification scheme prior to application.

1.16.6 In lieu of a small phenolic tag, a plastic or clear tape label, or simple color dot sticker placed on ceiling grid at approximate location of the device shall be acceptable. Selected marking scheme shall accompany a schedule or legend which copy shall be included in O&M manual or/and posted in mechanical room. Abbreviations and color coding shall be per ANSI/ASME A13.1 as applicable.

1.17 SAFETY GUARDS:

Contractor shall furnish and install all safety guards required. All belt driven equipment, projecting shafts and other rotating parts shall be enclosed or adequately guarded.

1.18 STORAGE OF MATERIALS:

Each contractor shall provide space for storage of materials, equipment or tools at ground level. Any storage contemplated within the building will be allowed only upon specific approval of the Architect.

1.19 MANUFACTURERS' DIRECTIONS:

The manufacturers' published directions shall be followed in the delivery, storage, protection, installation, piping and wiring of all equipment and material. The Contractor shall promptly notify the Architect in writing of any conflict between the requirements of

the contract documents and the manufacturers' directions and shall obtain the Architect's instructions before proceeding with the work. Any such work performed that does not comply with the manufacturers' directions shall have deficiencies corrected at no cost to the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS:

All materials shall be new and free from defects at the time of installation. Materials or equipment damaged in shipment or otherwise damaged prior to installation shall not be repaired at the job site, but shall be replaced with new materials.

2.02 MANUFACTURER'S REQUIREMENTS:

When a manufacturer's name appears in these specifications, it is not to be construed that the manufacturer does not have to meet the full requirements of the specifications or that his standard cataloged item will be acceptable.

2.03 SERVICE AND REPAIR PARTS:

All equipment installed on this project shall have local representation, local factory authorized service, and a local stock of repair parts.

2.04 FLAME SPREAD PROPERTIES OF MATERIALS:

All materials and adhesives used for air conditioning filters, acoustical lining, and insulation shall conform to NFPA and UL life, safety and flame spread properties of materials. The composite classifications shall not exceed 25 for a flame spread rating and 50 for a smoke developed rating for these classifications as listed for the basic materials. The finishes, adhesives, etc., specified for each system shall be such when completely assembled.

2.05 ACCESS PANELS:

Provide flush mounted metal access panels and frames with concealed hinges and key actuated locks for all concealed and otherwise inaccessible valves, parts, fittings, fire dampers, equipment, filters, etc. and as required for inspection or service.

PART 3 - EXECUTION

3.01 WORKMANSHIP:

3.01.1 All work shall be done by experienced craftsmen skilled in the applicable trade.

3.01.2 Sloppy work shall be rejected and corrected at no additional expense.

3.02 PROTECTION OF EQUIPMENT:

The Contractor shall continuously maintain adequate protection of stored materials and installed equipment. Fixtures and equipment, located inside or outside shall be protected against dirt, rust, moisture and abuse from other trades. Materials and equipment shall not be stored directly on the ground. Ductwork, piping and equipment shall not be used by other trades as supports for scaffolds for personnel. At the completion of the work, equipment, fixtures, exposed supports and piping shall be vacuumed free of loose dirt and cleaned to the satisfaction of the Architect. Repairs made necessary by damage shall be paid for by the Contractor.

3.03 PROTECTION OF STRUCTURE:

Each Contractor in performing his work shall take particular care not to damage the structure. All finished floors and step treads shall be covered to prevent any damage by workmen or their tools and equipment during the construction of the building. In addition, each Contractor shall protect any materials on the job site whether a part of this contract or the property of another Contractor.

3.04 LARGE EQUIPMENT:

All large pieces of equipment which will be installed in the building, and which are too large to permit access through doorways, stairways or shafts, shall be brought to the job by the Contractor and placed in the spaces before the enclosing structure is closed in.

3.05 FOUNDATIONS:

3.05.1 Concrete foundations required by mechanical equipment shall be constructed by this Contractor. See Concrete Work.

3.05.2 Equipment shall be set in place on the bases, leveled and aligned by means of shims, piped, then grouted in, in that order. After grouting, the forms shall be removed and the surfaces of the foundation shall be hand-rubbed with carborundum. Concrete work shall conform to the requirements of General Specifications, Concrete Work, of this specification.

3.06 CONFLICTS, INTERFERENCES AND COORDINATION BETWEEN TRADES:

3.06.1 The drawings are not to be construed as shop drawings, but indicate the extent, general location, arrangement, etc., of piping systems and equipment. This Contractor shall refer to other sections of the specifications and other drawings such as electrical, structural, architectural, etc., in order to eliminate conflicts and undue delays in the progress of the work. Where other Contractors furnish items requiring piping connections by this Contractor, they will be held responsible for providing roughing-in drawings and

assistance upon request.

3.06.2 Each trade shall so harmonize its work with that of the other trades so that the work may be done in the most direct and workmanlike manner without hindering the other trades. Piping interference shall be handled by giving precedence to pipe lines which require a stated grade for proper operation. Where space requirements conflict, the following order of precedence shall be observed:

A. Building lines

B. Structural members

C. Soil and drain piping

D. Vent piping

E. Refrigerant piping

F. Condensate piping

G. Supply ductwork

H. Exhaust ductwork

I. Domestic water

J. Electrical conduit

K. Natural gas piping

3.06.3 In the event of conflicts between specifications and drawings, drawings shall take precedence over specifications except in matters pertaining to quality, applications, and coordination between trades, which shall be governed by specifications.

3.06.4 In the event of conflict between codes, as interpreted by the authority having jurisdiction and the contract documents, the codes shall govern.

3.06.5 In the event of conflict between manufacturer's installation instructions and the drawings, the manufacturer's installation instructions shall govern.

3.07 CUTTING AND PATCHING:

3.07.1 All cutting required by the installation of sleeves, piping, equipment, etc., shall be performed by this Contractor. Patching shall be by this Contractor. This Contractor shall not cut any structural element or any finished work without permission from the Engineer.

3.07.2 This Contractor shall cut and patch all paving as required by the installation of buried piping, including utilities.

3.07.3 Refer to paragraph 1.09 of these specifications.

3.08 PAINTING:

3.09.1 All painting including "touch-up" shall be provided by the Mechanical Contractor unless noted otherwise. All exposed piping, equipment, etc., shall be clean and free from rust or grease before painting takes place. All supporting steel shall be wire brushed and primed with at least one coat of rust preventative primer.

3.08.2 Where equipment finishes are damaged, this Contractor shall obtain matching color touch-up paint from the equipment's manufacturer and paint as required.

3.09 LUBRICATION:

This Contractor shall provide all lubricants for the operation of all equipment until acceptance. The Contractor shall be required to protect all bearings during the installation and shall thoroughly grease steel shafts to prevent corrosion. All motors and other equipment shall be provided with covers as required for proper protection during construction. All equipment bearings requiring periodic lubrication shall be provided with proper fittings for this purpose. Where equipment requiring such lubrication is not readily accessible due to location, copper tubing extensions shall be provided in addition to lubrication fittings.

3.10 ELECTRICAL WORK:

3.10.1 Except for such items that are completely wired at their point of manufacture and so delivered and unless specifically noted to the contrary herein, the Mechanical Contractor shall do all power wiring from the disconnect switch or breakers to the equipment requiring power. This includes mounting of all electrical devices furnished under this section (Mechanical) of these specifications. All work shall be performed by a licensed electrician.

3.10.2 Wiring for all automatic controls, temperature control, temperature indication, and interlock wiring will be done by the Mechanical Contractor. The furnishing of all disconnect switches as required for proper operation as shown on the drawings and required by code will be by the Electrical Contractor, except where specifically designated otherwise on the plans. The furnishing of all starters for mechanical equipment will be done under this section (Mechanical) of these specifications, unless specifically scheduled otherwise on a starter schedule on the drawings and shall be installed by the Mechanical Contractor. All control wiring shall be installed in conduit.

3.10.3 Furnishing of complete wiring diagrams showing power wiring and interlock wiring

shall be work under the trade supplying the equipment. Diagrams shall be based on approved equipment and shall be complete integral drawings, not a series of manufacturer's individual diagrams. After these diagrams have been approved by the Architect/Engineer, copies shall be furnished to the trades involved and they shall be followed in detail.

3.10.4 The electrical design and drawings are based on the equipment scheduled and shown on the drawings and should any mechanical equipment requiring changes to the electrical design be approved, the required electrical changes shall be made at the expense of the trade furnishing the changed equipment and at no cost to the Owner.

3.10.5 All work under this division shall be performed in strict accordance with Division 16-Electrical of these specifications and the latest edition of the National Electrical Code.

3.10.6 Smoke detectors shall be furnished by the Electrical Contractor and installed by the Mechanical Contractor. Electrical Contractor shall be responsible for all power wiring and the Mechanical Contractor shall be responsible for all control wiring.

3.11 EQUIPMENT CONNECTION:

This Contractor shall bring required services to equipment items furnished under other sections of this specification or by the Owner, make final connections, and leave equipment ready for operation. Where it is necessary for Contractors performing work covered by this section to make final connections to items of equipment being furnished by Contractors under other sections, all such work shall be performed in a neat and workmanlike manner and all materials shall be of quality and finish normally used for such installation.

3.12 OPERATION PRIOR TO COMPLETION:

When any piece of mechanical or electrical equipment is operable and it is to the advantage of the Contractor to operate the equipment, he may do so providing that he properly cleans the equipment, installs clean filter media, properly adjusts and completes all punch list items before final acceptance by the Owner. The date of acceptance and the start of the warranty may not be the same date.

3.13 EQUIPMENT AND ARRANGEMENTS:

All equipment shall be installed in a manner to permit access to all surfaces requiring access. All valves, motors, drives, lubrication devices, filters and other necessary items shall be installed in a position to allow removal for service without disassembly of another part.

3.14 EXECUTION OF WORK:
The Contractor shall plan, schedule and execute his work and that of any of his Sub-contractors so as not to interfere with the work of other trades or Contractors in the

building or on the premises.

3.15 FLASHING AND WATERPROOFING:

All building penetrations to outside shall be flashed and counter flashed as required to eliminate leaks.

3.16 TESTS:

All tests shall be made by this Contractor and repeated until approved by the Engineer. Piping systems shall not be covered or otherwise concealed until tests have been made and approvals obtained. Notify the Engineer four days prior to tests to allow for scheduling. Test the piping systems as indicated in applicable articles.

3.17 CLEAN-UP:

3.17.1 It shall be the responsibility of each trade to cooperate fully with the other trades on the job to help keep the job site in a clean and safe condition. At the end of each day's work, each trade shall properly store all of his tools, equipment, any surplus materials and all debris caused by his portion of the work.

3.17.2 When all work has been finally tested, the Contractor shall clean all work installed by him, including all fixtures, equipment, pipes, ducts and all exposed work. All pipes shall be flushed out and left free of all obstructions. All plates, grilles, and other finished products shall be thoroughly cleaned and polished.

3.18 FINAL INSPECTIONS:

3.18.1 It shall be the duty of the Contractor to make a careful inspection trip of the entire project, assuring himself that the work on the project is ready for final acceptance, before calling upon the Engineer to make a final inspection.

3.18.2 In order not to delay final acceptance of the work, the Contractor shall have all necessary bonds, guarantees, receipts, affidavits, etc., called for in the various articles of this specification, prepared and signed in advance, and together with a letter of transmittal listing each paper included, and shall deliver the same to the Engineer at or before the time of the final inspections. The Contractor is cautioned to check over each bond, receipt, etc., before preparing same for submission to see that the items check with the requirements of the specification.

3.19 DEMOLITION AND SALVAGE:

3.19.1 Where demolition of equipment or materials is required this Contractor shall minimize cutting and exercise all due caution to leave undamaged surfaces, material and equipment meant to remain.

3.19.2 All existing items that are to be removed shall remain the property of the Owner unless declared as unsalvageable. Unsalvageable materials shall become the property of the Contractor and be removed from the site. Items declared as Owner's property shall be neatly stored on the site as directed by the Owner.

3.20 SCHEDULE OF ALTERNATES:

On the Bid Form in the proper locations, state the dollar amounts to be added to or deducted from the Base Bid amount if the alternate bid work is accepted by the owner. Write in the words “Add” or “Deduct” as appropriate along with the amount quoted. Write in the words "No Change" if there will be no change in the Base Bid contract amount if the alternate bid is accepted.

Add Alternate #1- Construct 1000 sq.ft. Tire Storage Building as shown on Sheet S6, A8.0 and PME-1, with 10’ wide concrete apron as shown on C2.0.

Add Alternate #2- delete 4” of gravel at Area 1, leaving 2” gravel base. Pave Area 1 (front of Shop) as shown on Civil drawings.

Add Alternate #3- delete 4” of gravel at Areas 1 and 2, leaving 2” gravel base. Pave Area 1 (front of Shop) and Area 2 (side driveways) as shown on Civil drawings.

Add Alternate #4- delete 4” of gravel at Areas 1, 2 and 3, leaving 2” gravel base. Pave Area 1 (front of Shop), Area 2 (side driveways), and Area 3 (back of Shop) as shown on Civil drawings.

END OF SECTION

23 50 50 - EQUIPMENT

PART 1 - GENERAL

1.01 GENERAL:

Refer to Section 23 00 10 for General Requirements for Mechanical Work.

1.02 SCOPE OF WORK:

Furnish and install all labor, materials, equipment, tools and services and perform all operations required in connection with, or properly incidental to, the construction of complete air conditioning equipment systems as indicated on the drawings, reasonably implied therefrom or as specified herein unless specifically excluded.

1.03 SCHEDULES ON DRAWINGS:

In general, all capacities of equipment and motor and starter characteristics are shown on schedules on the drawings. Reference shall be made to the schedules for such information. The capacities shown are minimum capacities. Variations in the characteristics will be permitted only on written approval of the Engineer. Insofar as is possible, all items of the same type (i.e., pumps, fans, etc.) shall be by the same manufacturer. Where instructions on installation are not included on these specifications or on the plans, the manufacturer's instructions shall be followed.

1.04 EQUIPMENT INSTALLATION AND WARRANTY SCHEDULE:

This Contractor shall refer to the architectural specifications for the required time schedule for the installation of equipment furnished as a part of this contract. The required time schedule will necessitate the setting-in-place of some items before the normal period of occupancy of the space and before the acceptance of substantial completion and subsequent approval by the Owner and Engineer. The Contractor is advised that the warranty for each item of equipment will not begin until after final acceptance of the building as defined in the architectural specifications, and the Subcontractor will, therefore, make the necessary arrangements with the equipment manufacturers for extended warranties as may be required.

1.05 REFERENCE STANDARDS:

ASHRAE Handbook – Equipment (Latest Edition)
ASHRAE Handbook - Fundamentals (Latest Edition)
ASHRAE Handbook - HVAC Systems & Applications (Latest Edition)
North Carolina State Building Code 2012
Standard For Installation of Air-Conditioning & Ventilating Systems - NFPA 90A
Standard Mechanical Code - SBCCI
Reference SECTION 23 00 10 for additional information

PART 2 - PRODUCTS

2.01 FILTERS:

2.01.1 To protect the equipment during construction and for the purpose of testing and balancing, this Contractor shall furnish and install a complete set of temporary filters. These temporary filters shall be of glass fiber in heavy cardboard frame with suitable retainers to hold the media in place.

2.02 EXHAUST FANS: <S> <OM>

2.02.1 MODELS SP-A

Ceiling mounted exhaust fans shall be of the centrifugal direct drive type. The fan housing shall be constructed of heavy gauge galvanized steel. The housing interior shall be lined with 0.5 in acoustical insulation. The outlet duct collar shall include an aluminum backdraft damper and shall be adaptable for horizontal or vertical discharge. The grille for sizes 50-390 shall be constructed of high impact polystyrene and for sizes 410-1550, the grille shall be constructed of aluminum. Grilles shall be non-yellowing. The access for wiring shall be external. The motor disconnect shall be internal and of the plug in type. The motor shall be mounted on vibration isolators. The fan wheel(s) shall be of the forward curved centrifugal type, constructed of galvanized steel and dynamically balanced.

2.02.2 MODELS SBE

Belt driven, axial type sidewall fans shall provide as follows:

Propellers shall be constructed with fabricated steel or fabricated aluminum. Propellers shall be securely attached to fan shafts. All propellers shall be statically and dynamically balanced. Motors shall be permanently lubricated, heavy duty type, carefully matched to the fan load and furnished at the specified voltage, phase, and enclosure. Ground and polished steel fan shafts shall be mounted in permanently lubricated, sealed ball bearing pillow blocks. Bearings shall be selected for a minimum (L10) life in excess of 100,000 hours at maximum cataloged operating speeds. Drives shall be sized for a minimum of 150 percent of driven horsepower. Pulleys shall be of the fully machined cast iron type, keyed and securely attached to wheel and motor shafts. Motors sheaves shall be adjustable for system balancing. Drive frame and panel assemblies shall be galvanized steel or painted steel. Drive frames shall be formed channels and fan panels shall have prepunched mounting holes, formed flanges, and a deep formed inlet venturi. Drive frames and panels shall be bolted construction or welded construction (level 3 fans only).

The axial exhaust fans shall bear the AMCA Certified Ratings Seals for both sound and air performance.

2.02.3 MODELS GB

Model GB Roof exhaust fans shall be centrifugal belt driven type. The fan wheel shall be centrifugal backward inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced. The fan housing shall be constructed of heavy gauge aluminum with a rigid internal support structure. The fan shroud shall have a rolled bead for added strength. Galvanized rigid wire protects the fan's discharge from birds or small objects.

Motors shall be heavy duty ball bearing type, carefully matched to the fan load, and furnished at the specified voltage, phase and enclosure. Motors and drives shall be mounted on vibration isolators, out of the airstream. Fresh air for motor cooling shall be drawn into the motor compartment from an area free of discharge contaminants. Motors shall be readily accessible for maintenance.

Drive frame assemblies shall be constructed of heavy gauge steel and mounted on vibration isolators. Precision ground and polished fan shafts shall be mounted in permanently sealed, lubricated pillow block ball bearings. Bearings shall be selected for a minimum (L10) life in excess of 100,000 hours at maximum cataloged operating speed. Drives shall be sized for a minimum of 150 percent of driven horsepower. Pulleys shall be of the fully machined cast iron type, keyed and securely attached to the wheel and motor shafts. Motor pulleys shall be adjustable for final system balancing.

A NEMA 3R disconnect switch shall be factory installed and wired from the fan motor to a junction box installed within the motor compartment.

A fan conduit chase shall be provided through the curb cap to the motor compartment for ease of installation.

Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.

2.02.4 Fans shall be AMCA air and sound licensed.

Acceptable Manufacturers: Greenheck, Loren Cook or Twin City.

2.03 MOTOR STARTERS: <S> <OM>

Part 1 Products

1.01 Section Includes:

A. Enclosed FVNR combination motor starters with electronic overload relay

1.02 References

The starters referenced in this section are designed and manufactured to the following standards unless otherwise noted:

A. ANSI/NFPA -70, National Electric Code
B. UL 508, and UL508A Industrial Control Equipment
C. NEMA ICS-2, 2000
D. IEC 60947-5, 60947-4, 60947-3

1.03 System Description

A. Combination Starters: Provide Combination Magnetic Starters for all motors 1 HP and above. Refer to Section 1.03.3 for combination magnetic starter requirements.

1.03.1 Enclosed Full Voltage Non-Reversing (FVNR) Non-Combination Three Phase Starter

A. Magnetic Motor Starters shall be enclosed in a general purpose electrical enclosure with the appropriate environmental rating.

B. Starters shall consist of a horsepower rated magnetic contactor with a minimum of 1NO and 1NC auxiliary contacts and solid state electronic overload relay. Overload relay shall protect all three phases with a wide range current setting and trip class to allow field adjustment for specific motor FLA. Interchangeable heater elements are not acceptable. Overload relay shall provide phase failure, phase loss, locked rotor and stall protection.

C. Provide a manual reset pushbutton on the starter cover to restore normal operation after a trip or fault condition.

D. Must provide over/under voltage and phase monitoring capability. Monitor shall be field adjustable for both over and under voltage levels and a delay time before returning to normal operation after a trip.

E. Each starter shall include an installed 50VA control power transformer (CPT) with protected secondary. The CPT must accept the available line voltage and the control voltage shall not exceed 120V.

F. Installed accessories shall include Hand-Off-Auto operation switch with 22mm style operator interfaces. Include LED pilot light indicators for Hand, Off, Auto, Run and Overload conditions. All pilot devices shall be water tight and dust tight.

G. Starter must measure and display output current on the front cover. If necessary, install digital or analog ammeter.

H. When remotely controlled by an automation system, the starter shall include remote run terminals which accept both a voltage input signal and a contact closure. The voltage run input shall accept both AC and DC signals including 24VAC, 120VAC, 24VDC and 48VDC to allow direct connection of the transistorized automation signal to the starter.

I. In applications where the motor is interlocked with a damper or valve, the actuator control must reside within the starter enclosure. The starter must provide a voltage output to operate the actuator to open the damper or valve without closing the motor circuit. The starter will only close the motor circuit and start the motor after it has received a contact closure from a limit or end switch confirming the damper or valve position.

J. The starter shall provide a provision for Fireman's Override operation. When activated, the starter run the motor in any mode (Hand, Off or Auto) regardless of other inputs or lack of inputs either manual or auto. The purpose of the Fireman's Override input is to act as a smoke purge function. Fireman's Override has priority over the Emergency Shutdown input.

K. If the starter is controlled by a fire alarm or life safety system, the starter shall include an Emergency Shutdown input which will disable the starter from operating in either Hand or Auto mode regardless of other inputs either manual or auto.

L. The starter shall provide the capability to monitor and calculate power consumption (kWh) of the motor load. Each starter shall display the calculated kWh and provide either a pulse output or 4-20mA analog signal to the automation system to monitor the power consumption.

M. Manufacturer shall provide and install tags with engraved white lettering to designate equipment served

1.03.2 Enclosed Full Voltage Non-Reversing (FVNR) Combination Three Phase Starter

A. Enclosed combination starters shall include all of the magnetic starter requirements in addition to a disconnecting method. Acceptable disconnects include: motor circuit protectors, UL 489 circuit breakers, or a fused disconnects. All disconnects shall include a lock-out mechanism when in the off position.

B. The Motor Circuit protector shall be a UL listed 508 current limiting manual motor starter with magnetic trip elements only. The breaker shall

carry a UL 508F rating (up to 100A frame size) which provides for coordinated short circuit rating for use with the motor contactor and provides a minimum interrupting rating of 30,000 AIC for the combination starter.

C. Fused disconnect shall be UL 98 suitable for service entrance protection. It shall accommodate time delay J-style fuses.

D. UL 489 breaker shall include thermal and magnetic trip mechanisms.

1.04 Quality Assurance

A. Manufacturer shall provide a five year warranty on the complete starter assembly.

B. The starter assembly shall be UL listed under UL 508A.

2.01 Submittals

Manufacturer shall provide copies of the following documents:

A. Product data sheets on specified products.

B. Shop drawings for specified product.

C. Wiring Schematics for specified products.

Acceptable Manufacturers: Cerus Industries, Square D, Cutler Hammer.

2.04 WALL LOUVERS: <S>

Provide 6" thick stationary extruded aluminum louvers where shown. Units shall exactly fit opening and be flashed completely weather tight.

Louver shall have drainable blades.

Maximum free area velocity for intake louvers shall not exceed 1201 ft. per minute with a maximum pressure drop of 0.24 inches wg and no more than 0.01 oz. water penetration at 1201 FPM.

Louver blades shall be a minimum 0.081 inches thick and rigidly bracketed for 20 pounds per square foot wind loading. Frame shall be minimum 0.125” thick.

See Schedule on the drawings for accessories.

Louvers shall be manufactured by Pottorff, Ruskin, Greenheck, United Enertech.

2.05 GAS FIRED INFRARED HEATERS: <S> <OM>

Heaters shall be equipped with a 24-volt direct spark ignition with automatic 100% shutoff system. Power supplied to each heater shall be 120 VAC, 60 Hz. The heater controls shall include a pressure switch designed to provide complete unit shutoff in the event of combustion air or flue blockage. The heaters shall be equipped with an on-line diagnosis monitoring light system. The three lights shall monitor the power to the heater, insufficient airflow and the spark ignition and combination gas valve operation.

The heater's burner shall consist of a heavy-duty cast iron atmospheric burner. The flame characteristics shall be highly luminous for maximum radiant heat transfer through the emitter tube wall.

The heater's emitter tube shall operate at an average surface temperature of 700ºF - 800ºF and shall be made of 16-gauge calorized aluminized steel or calorized titanium alloy Alumi-Therm steel for long life (4" O.D.). The emitter tube shall be calorized for longevity, corrosion resistance, and high radiant efficiency. The measured surface emissivity shall be 0.83 - 0.86 at operating temperature. The calorization process shall produce an emitter tube that is highly radiant absorptive (0.95) on the interior and highly radiant emissive (0.83-0.86) on the exterior. The system shall have a radiant efficiency (or radiant coefficient) of 58%.

To assure a high degree of safety and increased radiant efficiency, the heaters shall operate under negative pressure at all times during operation to preclude the escape of combustion gases inside the building. The heater exhaust assembly shall include a 120-volt draft inducer. The draft inducer shall be equipped with a permanently lubricated, totally enclosed and shielded, fan cooled, and heavy-duty ball bearing motor. The motor shall not require maintenance or lubrication for the life of the unit. The draft inducer assembly shall be capable of rotating 90º for vertical or horizontal venting.

The heaters will be CSA design certified for vertical or horizontal venting, maximum 75 feet horizontal sidewall venting, and for 50 feet outside combustion air inlet duct. There shall be no draft hoods. The combustion chamber shall be totally enclosed.

The heaters shall utilize factory assembled, highly efficient aluminum reflectors with a reflectivity of 97.5%. The reflector ends shall be enclosed for maximum radiant heat output and minimum convection losses.

The heaters shall be factory assembled and tested. The heaters shall not require any field adjustments to assure maximum performance and safety.

Heaters shall operate satisfactorily in any position from horizontal to forty-five degrees (45º) from horizontal, and incline mounted up to 2/12 pitch, and shall be suitable for vented/indirect vented applications. Heaters shall be designed to operate on natural or propane gas.

Heaters shall be design certified by the Canadian Standards Association (CSA) to American National Standard Z83.20/CSA 2.34. The manufacturer shall provide a written limited warranty covering the heavy one-piece cast iron burner for a period of ten (10) years, the emitter tube for a period of five (5) years and all components utilized in the heater's control assembly for a period of one (1) year.

Acceptable Manufacturers: Space-Ray, Roberts Gordon, Superior Radiant and Swank.

2.06 GAS FIRED FURNACE: <S> <OM>

NATURAL GAS MODELS
Central Heating furnace designs are certified to ANSI Z21.47 / CSA 2.3 for both natural and L.P. gas. Limit setting and rating data were established and approved under standard rating conditions using American National Standards Institute standards.

SAFE OPERATION
The Integrated System Control has solid state devices, which continuously monitor for presence of flame, when the system is in the heating mode of operation. Dual solenoid combination gas valve and regulator provide extra safety.

QUICK HEATING
Durable, cycle tested, heavy gauge **aluminized steel heat exchanger** quickly transfers heat to provide warm conditioned air to the structure. **Low energy power vent blower,** to increase efficiency and provide a positive discharge of gas fumes to the outside.

BURNERS
Multiport Inshot burners will give years of quiet and efficient service. All models can be converted to **L.P. gas** without changing burners.

INTEGRATED SYSTEM CONTROL
Exclusively designed operational program provides total control of furnace limit sensors, blowers, gas valve, flame control and includes self diagnostics for ease of service. Also contains connection points for E.A.C./humidifier.

AIR DELIVERY
The four speed, direct drive blower motor, has sufficient airflow for most heating and cooling requirements, will switch from heating to cooling speeds on demand from room thermostat. The blower door safety switch will prevent or terminate furnace operation when the blower door is removed.

STYLING
Heavy gauge steel and “wrap-around” cabinet construction is used in the cabinet with baked-on enamel finish for strength and beauty. The heat exchanger section of the cabinet is completely lined with foil faced fiberglass insulation. This results in quiet and

efficient operation due to the excellent acoustical and insulating qualities of fiberglass. Built-in bottom pan and alternate bottom, left or right side return air connection provision.

FEATURES AND GENERAL OPERATION
The XR 95 High Efficiency Gas Furnaces employ a Silicon Nitride Hot Surface Ignition system, which eliminates the waste of a constant burning pilot. The integrated system control lights the main burners upon a demand for heat from the room thermostat. Complete front service access.
a. Low energy power venter
b. Vent proving pressure switch.

XR 95 Standard Equipment
• Power supply 115/1/60
• Convertible to horizontal
• **Type 29-4C™** stainless steel secondary heat exchanger
• Inner blower doors
• Direct drive, 4-speed motors
• Silicon Nitride igniter with adaptive heat up
• Accessory hook-up capability – Hum and EAC
• Quiet induced draft blower
• Blower door safety switch
• Dual solenoid combination gas valve & regulator
• PVC venting – 1 or 2 pipe vent option
• Left/right gas connection
• Selectable cooling fan off delay eliminates need for BAY24X045 time delay relay
• Single wire twinning
• Integrated solid state control with self diagnostics
• 24 volt fuse
• Manual reset burner box limit

Acceptable Manufacturers: Trane, Lennox, Johnson Controls.

2.07 SPLIT SYSTEM CONDENSING UNIT – COOLING ONLY: <S> <OM>

General
The 4TTA3 shall be fully charged from the factory for matched indoor section and up to 15 feet of piping. This unit must be designed to operate at outdoor ambient temperatures as high as 115°F. Cooling capacities shall be matched with a wide

selection of air handlers and furnace coils that are ARI certified. The unit is certified to UL 1995 application.

Casing
Unit casing is constructed of heavy gauge, galvanized steel and painted with a weather-resistant powder paint. Corrosion and weatherproof CMBP-G30 DuraTuff™ base.

Refrigerant Controls
Refrigeration system controls include condenser fan and compressor contactor. High and low pressure controls are inherent to the compressor. Another standard feature is the liquid line dryer.

Compressor
The Climatuff® compressor features internal over temperature and pressure protector, total dipped hermetic motor and thermostatically controlled sump heater. Other features include: roto lock suction and discharge refrigeration connections, centrifugal oil pump, and low vibration and noise.

Condenser Coil
The Spine Fin™ coil shall be continuously wrapped, corrosion resistant all aluminum with minimum brazed joints. This coil is 5/16 inch O.D. seamless aluminum glued to a continuous aluminum fin. Coils are lab tested to withstand 2,000 pounds of pressure per square inch. The outdoor coil provides low airflow resistance and efficient heat transfer. The coil is protected on all four sides by louvered panels.

Low Ambient Cooling
As manufactured, this unit has a cooling capability to 55°F. The addition of an evaporator defrost control permits operation to 30°F. The addition of a low ambient kit permits low ambient cooling to 0°F.

Acceptable Manufacturers: Trane, Lennox, Johnson Controls.

2.08 VEHICLE EXHAUST SYSTEM: <S> <OM>

Fan
GENERAL DESCRIPTION:
The **UNICO** Series Overhead Inlet features a powder welded and powder coated angle iron frame capable of supporting a direct drive blower as well as a single or dual inlet. The UNICO system may be used with 3”, 4”, 5” & 6”Ø flexible tube. The standard UNICO system comes equipped with an angle iron frame, flexible tube, clamps, CTA clamping tailpipe adapter, balancer, flexible tube connection, and flange set. The UNICO may also be equipped with a direct drive blower as well as a dual inlet connection so that two flexible tubes may be used. This arrangement also requires a second balancer for the additional flexible tube drop.

TECHNICAL CHARACTERISTICS:
Frame Material: 2" x 2" x 1/8" angle iron (powder coated)
BB-4 Balancer: 15-pound capacity, locking type

FLEXIBLE TUBING OPTIONS:
Series XT-65: For high temperature applications, constructed of two-ply, triple overlap thermoplastic impregnated polyester with an enclosed steel helix. See NSGV Page No. 2006-53

EXHAUST HOSE:
GENERAL DESCRIPTION:
The NSGV Series **XT-65** is extremely flexible, light weight and can be utilized in high temperature applications up to +650º F continuous and +850º F intermittent. Maximized durability is achieved by a two-ply, triple overlap thermoplastic polyester fabric construction. The tubing will be reinforced with a 12-gauge spring steel wire helix that is enclosed in the making of the tube. The cloth shall have a .028 Mil thickness and be National Blue in color with an OSHA Yellow wear strip. The wear strip serves as a protective measure against scratching of vehicles.

TECHNICAL CHARACTERISTICS:
Temperature rating: -20ºF to +650ºF continuous / +850ºF intermittent
Retardant Abilities: Listed as UL 94 V-O flame retardant
Compression Ratio: 4:1
Pitch: 2"
Standard Length: 25'-0" and 50'-0"
Diameter Range: 2" thru 16"
Color: National Blue with OSHA Yellow wear strip

The Vehicle Exhaust System shall be UL, MET, Etc. Class Rated. If the sytem is not UL, MET, Etc. Class Rated, M.C. shall include in his Base Bid price to provide "In the Field" UL, MET, Etc. Class Rating Certification. The In the Field Listing is to be performed by an approved 3rd Party Inspection Company. Refer to the NCDOA website for a complete list of approved 3rd Party Testing Companies.

Acceptable Manufacturers: National System of Garage Ventilation (NSGV), Nederman, and DSP Monoxivent.

2.09 GUARANTEE:

This contractor shall guarantee all materials, equipment and workmanship for one (1) year following final inspection and acceptance of the building by the Architect and the Owner. This applies to all materials and equipment installed under this contract, regardless of the source.

The one (1) year guarantee period will start on the day of final inspection and

acceptance of the building by the Architect and the Owner for occupancy by the Owner. The contractor shall provide to the Architect a letter with two (2) copies stating the beginning and ending date of the guarantee based on the aforementioned starting dates.

The contractor shall provide to the Owner in writing an additional four (4) year guarantee on all new refrigeration compressor units and heat exchanger.

END OF SECTION

23 60 10 - PIPING SYSTEMS

PART 1 - GENERAL

1.01 SCOPE:

Work in this section shall include piping, fittings, accessories etc., to be used in piping systems in accordance with the intent of the Contract Documents and shall include the following principal items:

Piping
Valves
Piping Accessories

1.02 REFERENCED STANDARDS:

National Bureau of Standards (NBS).
Cast Iron Soil Pipe Institute (CISPI).
American Society of Testing & Materials (ASTM).
American Water Works Association (AWWA).
National Fire Protection Association (NFPA).
Factory Mutual Engineering Corporation (FM).
American Society of Mechanical Engineers (ASME).

1.03 SUBMITTALS:

Submittals are required as indicated only. Submittal of pipe and fittings is not required unless a deviation from the specification is proposed.

PART 2 - PRODUCTS

2.01 CONDENSATE DRAIN PIPING :

Condensate drain piping for condensing equipment shall be PVC piping sized per manufacturer's installation instructions. Insulate with 1-1/2" fiberglass insulation with ASJ jacket. **Do not use Armaflex in return air plenum.**

2.02 GAS PIPING:

Furnish and install a system of gas piping as shown on the plans. All gas piping within the building shall be run exposed unless specifically shown otherwise. Any gas piping concealed within the building shall be properly vented to the outside.

All gas piping shall be standard weight black steel pipe per ASTM A-120-55. All fittings 2-1/2" and smaller shall be standard weight black malleable iron screwed per ASTM A-197-65. Screw thread joints shall be made with an approved compound & shall comply with

ANSI Standard for Pipe Threads, B2.1-1968.

Care shall be taken to keep the inside of piping dry and free of dirt, cutting burrs and other foreign substances. All threaded piping shall be reamed smooth after cutting and shall be threaded with true, sharp dies to insure a proper joint make-up.

All equipment connection shall be preceded by a manual stop cock, union and 12" drip leg.

Gas cocks 2" and smaller shall be all iron with brass square head plug; cock larger than 2" shall be lubricated plug cocks, 0 psi wog. Shut-off valves (stop-cocks) shall comply with ANSI Z21., ANSI Z21.21 or ANSI B16.33 or ANSI/UL 842.

Unions 2-1/2" and smaller shall be Grinnell 463, or equal, black malleable iron, ground joint, brass to iron seat unions. Unions 3" and larger shall be Crane Company Standard malleable iron gasket type flange unions with proper gasket.

All exposed gas piping whether interior or exterior to the building shall be painted with two coats of rust preventative paint. Gas piping shall be identified at 10'-0" intervals: "Natural Gas – 0.5 PSIG".

All underground piping shall have a warning tape installed in the backfill between 6 inches and 24 inches below the finished grade and shall be installed directly above the piping. In addition to the warning tape, the contractor shall provide and install an insulated tracer wire (yellow in color) adjacent to nonmetallic piping with each end of the wire terminating above ground. The tracer wire shall not be less than 18 AWG and the insulation shall be suitable for direct burial. If the above ground terminations cannot be achieved, the contractor shall provide access to the wire to meet the requirements of Section 404 of the 2012 NC Fuel Gas Code.

Underground gas piping shall be Type “K” semi-rigid copper tubing. If pre-approved by Engineer’s Office, Local Authority, and codes, underground gas piping may be orange polyethylene plastic piper per ASTM D-2104-74, D-2239-74, and D-2737-74 with fusion joints equal to PPI PE 2306 in lieu of wrapping black steel pipe. M.C. shall size per manufacturer’s recommendations.

The gas piping shall be bonded to the structural steel in accordance with section 250.104(B) of the latest edition of the National Electric Code by the Mechanical Contractor.

Gas Piping shall be tested in strict accordance with Section 406 of the 2012 NC fuel Gas Code.

2.03 PIPING ACCESSORIES GENERAL:

2.03.1 Flanges shall be slip-on or butt welding standard weight 1/16" raised face type

with gaskets.

2.03.2 Unions shall be all bronze for copper systems and malleable iron with ground joint for steel piping systems. Provide dielectric unions for joining dissimilar metallic piping systems.

2.03.3 Weldolets and threadolets shall be steel per ANSI B16.9.

2.03.4 Escutcheons shall be single piece, set screw type, chrome plated and shall cover the opening and sleeve.

PART 3 - EXECUTION

3.01 PIPING INSTALLATION:

3.01.1 The piping systems required under the Mechanical division of these specifications shall be installed in a neat and workmanlike manner. All pipe hangers shall be of the type mentioned in this section and shall be so spaced and installed as to maintain a rigid piping system, adequately supported both laterally and vertically.

3.01.2 At each piece of equipment, gate valves or gas cocks shall be furnished and installed by this Contractor so that these groups of pieces of equipment may be isolated from accessible locations. Provide General Contractor with locations of all access doors. Access doors required for these valves shall be furnished by this Contractor.

3.01.3 Each of the piping systems shall be installed to provide for expansion and contraction and the joints shall be soldered or welded at such time that the system is not under strain.

3.01.4 Necessary spring pieces and offsets shall be furnished by this Contractor as required.

3.01.5 Each of the piping systems shall be concealed in chases and above ceilings and in walls in all finished areas and shall be run exposed only as specifically specified or as shown on the drawings in machinery spaces or unfinished areas.

3.01.6 Exposed piping shall be held close to the walls and ceilings and necessary fittings shall be provided and installed to allow for offsets to hold the piping close to wall and ceilings. Where these lines run exposed a clearance shall be obtained from the Architect in writing before making the installation.

3.01.7 All valves shall be so located as to make the removal of their bonnets possible. All flanged valves shown in the horizontal positions shall be mounted with valve stem inclined one bolt hole above the horizontal lines shall be "made-up" with valve stem inclined at an angle of thirty (30) degrees above the horizontal position. All valve stems must be true and straight at the time the system is tested for final acceptance.

3.01.8 Pipe shall be cut accurately to measurements established at the site and worked into place without springing or forcing.

3.01.9 Provide clearance for installation on insulation and for access to valves, air vents, drain and unions.

3.01.10 Slope piping as indicated and provide manual air vents at high points of system. Extend 1/4" soft copper extensions from vents to suitable drain where manual air vents are in inaccessible locations.

3.01.11 Provide a 1/2" thick foam plastic insulating sleeve-protector on all copper and plastic piping penetrations of concrete slab-on-grade prior to pouring of concrete.

3.01.12 Locate and suspend piping in such a manner so as to minimize transmission of vibration and noise.

3.01.13 All piping penetrations through fire rated ceilings, walls or floors shall be fire stopped using approved materials to maintain the fire rating of the ceiling, wall or floor structure. **NOTE: THIS PROJECT REQUIRES ALL PIPING PENETRATIONS THROUGH CEILINGS, WALLS OR FLOORS BE FIRE STOPPED WHETHER FIRE RATED OR NOT, EVEN THOUGH THIS PROJECT DOES NOT HAVE ANY FIRE RATED CEILINGS, WALLS OR FLOORS.**

3.01.14 All piping connections to equipment and fixtures shall contain flanges or unions to allow easy removal whether or not shown on the plans.

3.02 PIPING JOINTS:

3.02.1 Screwed joints shall have full cut pipe threads. Joints shall be assembled with an approved compound applied to only the male threads. A minimum of three pipe threads shall remain exposed when the joint is assembled.

3.02.2 Solder joints shall be assembled with square cut pipe using a pipe cutter. Hack saw cut pipe ends shall be reamed to full size. Both the pipe and fittings shall be furnished absolutely clean. Brazing flux shall be applied to both the pipe and the fittings. The use of corrosive acid flux will not be permitted. During the brazing, the pipe and fittings must be changed with nitrogen gas.

3.02.3 Welded pipe joints shall be fusion welded by a metallic arc welding process. The welding operations shall conform to the current recommendations of the American Welding Society. This Contractor's welder, employed on this project, shall have passed qualification tests as prescribed by the National Pipe Welding Bureau or other reputable testing laboratory using qualification procedures as recommended by the ASME Boiler Construction Code or American Welding Standards.

3.03 SECURING AND SUPPORTING OF PIPE:

3.03.1 All pipe shall be supported from the building structure by means of approved hangers and supports. Piping shall be supported to maintain required grade and pitch, prevent vibration and provide for expansion/contraction.

3.03.2 All hangers shall be secured to approved inserts wherever possible and practicable. Hanger inserts shall be set in place before concrete is poured. Where hangers attach to the structural steel framing, approved beam clamps shall be employed. Where required, the Mechanical Subcontractor shall install channels to span between framing members. In no case shall spacing of hangers be greater than indicated on the following schedule:

FERROUS (SCHEDULE 40) PIPING

NOMINAL PIPE SIZE (MAXIMUM)	HANGER SPACE
1/2"	5'-0"
3/4"	6'-0"
1"	7'-0"
1-1/2"	8'-0"
2" to 2-1/2"	10'-0"
3" to 3-1/3"	12'-0"
4" to 6"	14'-0"

COPPER (CONDENSATE) PIPING

NOMINAL PIPE SIZE (MAXIMUM)	HANGER SPACE
Up to 3/4"	6'-0"
1" to 1-1/2"	8'-0"
1-1/2" to 2"	10'-0"
Larger than 2"	12'-0"

3.03.3 Vertical lines shall be adequately supported at their bases, either by a suitable hanger placed in the horizontal line near the riser, or by a base fitting set on a pedestal or foundation and from each floor slab by means of approved clamp type support bearing or the slab or beam.

3.03.4 Hangers for piping 2" and smaller shall be of the split cast ring type with fastening device. Hangers for piping larger than 2" shall be of the adjustable clevis hanger type. Hanger rods shall be minimum 3/8" diameter and shall have machine threads. Brackets of approved type may be used along walls. Hanger rods for individually suspended horizontal pipes shall be steel rods of size indicated on the following table:

NOMINAL PIPE SIZE (MAXIMUM)	ROD SIZE
1/2" to 2"	3/8"
2-1/2" to 3"	1/2"
4"	5/8"
5" to 6"	3/4"
8" to 12"	7/8"

3.03.5 Hangers for use with copper piping shall be copper plated ferrous sizes for copper tubing.

3.03.6 Hangers shall be installed within 2'-0" of each change in direction, either vertical or horizontal, or pipe tee and on each side of valves, strainers, etc.

3.03.7 Multiple horizontal pipes, smaller than 12" diameter pipe, may be supported on trapeze hangers. Trapeze spacing shall be in accordance with the schedule for pipe spacing based upon the smallest pipe. The trapeze members shall be properly sized for the piping load they are to support.

3.03.8 Where "cold" pipes are insulated with a vapor sealing jacket, the hanger shall be oversized accordingly to accommodate the outside diameter of the insulation, and half-round 16 gauge galvanized steel shields, not less than 14" long, rolled to fit the insulation diameter, shall be provided between the insulation and the hanger.

3.03.9 Pipe supports shall be as manufactured by Fee and Mason, Grinnell, F&S Manufacturing, or Michigan Hanger.

END OF SECTION

23 60 50 - SHEET METAL WORK AND ACCESSORIES

PART 1 - GENERAL

1.01 GENERAL:

1.01.1 Where any reference to "sheet metal work" or "ductwork" appears in this section of these specifications or on the drawings, it shall be construed to include exhaust ducts, relief ducts, plenums, casings for air handling units, duct taps, grille taps and diffuser connections and all other related pieces and parts of the air conveying systems.

1.01.2 Before starting shop drawings or fabrication of any ductwork, the Contractor must have an approved reflected ceiling plan with which he can coordinate location of air outlets, lights, tile patterns, etc.

1.02 SCOPE OF WORK:

Furnish and install all labor, materials, equipment, tools and services and perform all operations required in connection with or properly incidental to the construction of complete Ductwork and Accessories System as indicated on the drawings, reasonably implied therefrom or as specified herein unless specifically excluded.

1.03 SHOP DRAWINGS:

Shop drawings shall be submitted on all items of sheet metal work only as specified hereinafter.

1.04 REFERENCE STANDARDS: (LATEST EDITION)

ASHRAE - Guide and Data Books.
SMACNA - HVAC Duct System Design
NFPA - 90A, 90B, 91, 96, 204
SMACNA - HVAC Duct Construction Standards

PART 2 - PRODUCTS

2.01 MATERIAL:

All sheet metal duct, plenum and casing construction, unless otherwise specified herein, shall be constructed of new, prime grade, continuous hot dip mill galvanized, lock forming quality steel sheets, per ASTM A 525-75 and shall have a galvanized coating of 1-1/4 ounces total for both sides of 1 sq. ft. of a sheet, in accordance W/G90 per ASTM 525 and ASTM 90. Construction shall be in strict accordance with the construction details and installation details in the referenced SMACNA and NFPA standards as specified.

2.02 LABELING AND GAUGE:

Each sheet shall be stenciled with manufacturer's name and gauge. If coil steel is used, coils shall be stenciled throughout on ten foot (10') centers with manufacturer's name and gauge. Sheet metal must conform to the tolerances listed in SMACNA HVAC Duct Construction Standards.

2.03 LOW PRESSURE DUCTWORK CONSTRUCTION:

2.03.1 Rectangular low pressure ducts shall be constructed and reinforced in accordance with "Rectangular Duct Reinforcement" of SMACNA HVAC Duct Construction Standards and NFPA 90A and 90B.

2.03.2 Round low pressure ducts shall be constructed in accordance with Table 3-2 and 3-3 "Round Duct Gauge Selection" and Figure 3-2 "Transverse Joints-Round Duct" of SMACNA HVAC Duct Construction Standards and NFPA 90A and 90B.

Elbows shall be smooth elbows; 5 piece 90 degree elbows or 3 piece 45 degree elbows all with centerline radius 1-1/2 times the duct diameter.

2.03.3 <S> Low pressure flexible ducts shall be in accordance with SMACNA HVAC Duct Construction Standards, NFPA 90A and 90B. Flexible duct shall be equal to Genflex Type IL-1, with couplings and end connections as required for proper installation and compatibility with ductwork system in which they are installed.

A. All flexible ducts shall have positive interior air seal permanently bounded to a zinc coated high carbon spring steel helix all sheathed in a Class 1 vapor barrier factory sealed at both ends. The composite assembly including vapor barrier shall meet the Class 1 requirements of NFPA for use in a return air plenum, and be labeled by Underwriters Laboratories, Inc. 181 with a flame spread rating of 25 or less and a smoke developed rating of 50 or under.

B. Low pressure flexible duct shall be rated to 1 1/2" w.g. working pressure.

C. Flexible duct taps into low pressure plenums or main ducts shall be made with factory fabricated 45ª side take-off and rigid round duct with damper, Young or equal bearings, Young or equal operators, and raised bead for tight, positive flex duct connection. Use insulation guard for internally lined ductwork.

D. Maximum lengths of flexible ducts shall be 6'-0".

2.03.4 **Important Note:** Supply ductwork designed to operate at static pressures from 1/4 to 2 In. W.G., inclusive, shall be sealed in accordance with SMACNA Seal Class C. The term "sealed" means to use mastic or mastic plus tape or gasketing as appropriate.

Unlisted pressure sensitive tape **shall not** be used as the primary sealant.

2.04 DUCT SUPPORTS:

2.04.1 All horizontal and vertical ducts shall be supported in accordance with SMACNA HVAC Duct Construction Standards.

2.04.2 Flexible ducts shall be free of sags and kinks and supported on minimum of 36" centers with 3/4" wide flat banding material. Perforated strap will not be acceptable.

2.05 DUCT LINER:

Deleted from this project.

2.06 AIR DISTRIBUTION DEVICES:

2.06.1 Grilles, registers and ceiling outlets shall be as scheduled in the plans and shall be provided with sponge rubber or soft felt gaskets. If a manufacturer other than the one scheduled is used, the sizes shown on the drawings shall be checked for performance, noise level, face velocity, throw, pressure drop etc., before the submittal is made. Selections shall meet the manufacturer's own published data for the above performance criteria. The throw shall be such that the velocity at the end of the throw in the five foot occupancy zone will not be more than 50 FPM or less than 25 FPM. Should grilles other than those scheduled by name be furnished, manufacturer shall be prepared to demonstrate compliance with noise criteria on request to Architect's satisfaction. All devices shall be tested per Air Diffuser Council and labeled as such.

Acceptable Manufacturers: Price, Titus, Metalaire, Krueger.

2.06.2 Each air distribution device shall be provided with a 3" thick, 3/4 lb density insulation blanket for condensation control.

2.06.3 Locations of outlets on drawings are approximate and shall be coordinated with other trades to make symmetrical patterns and shall be governed by the established pattern of the lighting fixtures or Architectural reflected ceiling plan. Where called for on the schedules, the grilles, registers and ceiling outlets shall be provided with deflecting devices and manual dampers. These shall be the standard product of the manufacturer, subject to review by the Engineer and equal to brand scheduled. All ceiling devices shall be furnished to be compatible with the type ceiling in which they are installed.

2.06.4 Air distribution devices shall be as manufactured by Titus, Price, Metalaire and shall be as scheduled on the drawings.

2.07 INSTRUMENT PORTS:

Instrument ports shall be a 2 5/8" diameter base, neoprene gasket 2" deep neck, screwed

cover operated with No. 024 spanner wrench, mounting screws, equal to Young 1101.

2.08 DUCT ACCESS DOORS:

Duct access doors shall be gasketed frame with wing nut fasteners, (1" thick insulation bonded to interior face), 8" x 8" size (duct opening) on ductwork up to 14" and 12" x 12" size on larger ductwork, equal to Young 1310. Access doors shall be provided at all fire dampers and smoke detectors in addition to other places specified in these specifications.

PART 3 - EXECUTION

3.01 WORKMANSHIP, QUALITY AND REQUIREMENTS:

3.01.1 Ductwork shown on the drawings, specified or required for the heating, ventilating and air conditioning systems shall be constructed and erected in a first class workmanlike manner in accordance with SMACNA recommendations for low pressure and medium pressure duct construction. This work shall be warranted for a period of one year from the date of acceptance of the job against noise, chatter, whistling or vibrations and free from pulsation under all conditions of operation. After the system is in operation, should these defects occur, they shall either be removed and replaced or reinforced as directed by the Engineer.

3.01.2 Ductwork shall be erected in the general locations shown on the drawings, but must conform to all structural and finish conditions of the building. Before fabricating any ductwork, the Contractor shall check the physical conditions at the job site and shall make all necessary changes in cross sections, offsets, etc., whether they are specifically indicated or not.

3.01.3 Provide manually operated volume control dampers in all branches, splits and taps for proper balancing of air distribution whether indicated on the drawings or not. Dampers to be either single blade or multi-blade as shown in the SMACNA manual as required. They shall have an indicating device with lock to hold damper in position for proper setting.

3.01.4 Damper operators in all unfinished areas shall be Young Series 400 of the exact style, type and size as required. All other operators shall be Young #315 and/or #895 as required. All dampers shall have Young end bearings on the rod at the opposite end from the operator. Where dampers are installed in ducts located above accessible type ceiling, damper operators shall not be extended through the finished ceiling. Damper operators above inaccessible ceilings shall be furnished with extension rods operable through diffuser and grille faces or from remote locations.

3.01.5 All square elbows shall have turning vanes per the SMACNA manual requirements except for any return air jumper ducts noted on drawings.

3.01.6 Furnish and install in the ductwork, hinged access doors to provide access to all

dampers, automatic dampers, fusible links, cleaning operations, etc. Where the ducts are insulated, the access doors shall be double skin doors with one inch (1") of insulation in the door. Factory fabricated doors as manufactured by Milcor or equal meeting these specifications will be acceptable.

3.01.7 Where ducts connect to fans, including roof exhausters, flexible connections shall be made using "Ventglas" fabric that is fire-resistant, waterproof, mildew-resistant and practically air tight and shall weigh approximately thirty ounces (30 oz.) per square yard. There shall be a minimum of one-half inch (1/2") slack in the connections and a minimum of two and one half inches (2 1/2") distance between the edges of the duct except that there shall also be a minimum of one inch (1") of slack for each inch of static pressure on the fan system.

3.01.8 Furnish and install screens on all ducts, fans, etc., and openings furnished by this Contractor which lead to, or are, outdoors. Screens shall be 16 gauge, one half inch (1/2") mesh in removable galvanized steel frames.

3.01.9 Furnish test openings with covers in each zone duct for taking readings of air velocities or pressures in ducts. See the SMACNA manual for cover construction.

3.01.10 All holes in ducts for damper rods and other necessary devices, shall be either drilled or machine punched, (not pin punched), and shall not be any larger than necessary. All duct openings shall be provided with sheet metal caps if the openings are to be left unconnected for any length of time. In general, sheet metal screws shall not be used in duct construction unless the head (not the point) of the screw is in the airstream. Transformations shall have a ratio of not more than one inch (1") in transformation to every seven inches (7") of length unless specifically shown otherwise on the drawings.

3.02 FLASHING:

3.02.1 Where ducts pass through roofs or exterior walls, suitable flashing shall be provided to prevent rain or air current from entering the building. The flashing shall be not less than No. 24 gauge galvanized steel.

3.02.2 Where ducts exposed to view pass through walls, floors or ceilings, furnish and install sheet metal collars to cover the voids around the duct.

END OF SECTION

23 70 10 - TEMPERATURE CONTROLS

SEQUENCE OF OPERATION:

1.01 SINGLE ZONE GAS FURNACE

A. Each unit shall be controlled by a stand-alone 7-day programmable thermostat with nigh time set back. Occupied Mode - All unit functions will be enabled for normal heating and cooling operation.

Normal Operation - When in occupied mode as described above, the dedicated unit control shall operate stages of heating and cooling to maintain space temperature setpoint. Unit shall cycle heating and cooling as required to maintain space setpoint. Outside air damper shall be manually set for minimum position when unit is energized.

1.02 MISCELLANEOUS SEQUENCE

Toilet exhaust fans shall be controlled by occupancy sensors in grille or by the wall switch.

The infrared gas tube heaters shall be controlled by the line voltage thermostat supplied with the heaters. When the room temperature falls below the thermostat set point, the flue fan will energize, the igniter will energize, and the gas valve will open, ensuring ignition until the temperature rises above the set point. Once the set point is reached, the gas valve will close, the flame will go out, and the flue vent fan will run until cool down of the unit is complete.

The ventilation fans will either run continuously or be controlled by a wall switch.

The vehicle exhaust fans will be controlled by a wall switch.

END OF SECTION

SECTION 23 80 10 - VIBRATION ISOLATION AND SEISMIC RESTRAINT

1.01 GENERAL

See Appendix B Sheet of the drawings, Structural Design, for Seismic Design Category, Use Group and Spectral Response Acceleration Values.

Important Note:
The appendix B on the project drawing cover sheet indicates the seismic design category is "C". Only the gas piping will be subject to seismic restraint requirements due to having a Ip = 1.5.

All gas piping furnished and installed under this contract shall be seismically restrained as required by Chapter 16, STRUCTURAL DESIGN, in the North Carolina Building Code, 2012 Edition and ASCE 7, latest edition. The Mechanical Contractor shall include in his/her bid price the cost to accomplish all requirements of the aforementioned code.

The contractor shall notify the local representative of the seismic restraint materials manufacturer prior to installing any seismic restraint devices. The contractor shall seek the representative's guidance in any installation procedures with which he is unfamiliar.

1. The local representative of the seismic materials manufacturer shall conduct periodic inspections of the installation of the materials herein specified, and shall report in writing to the contractor any deviations from good installation practice observed.

2. Upon completion of the installation of all seismic restraint devices herein specified, the local representative of the seismic materials manufacturer shall inspect the completed system and report in writing any installation errors, improperly selected seismic devices, or other fault in the system which could affect the performance of the system.

3. The installing contractor shall submit a report to the building architect and/or engineer, including the manufacturer's representative's final report, indicating that all seismic restraint material has been properly installed, or steps to be taken by the contractor to properly complete the seismic restraint work as per the specifications.

1.02 QUALITY CONTROL:

1.02.1 All isolation materials, flexible connectors, and seismic restraints shall be of the same manufacturer and shall be selected and certified using published or factory certified data. The isolators and seismic restraint systems shall be manufactured by Amber / Booth. Approved equals by Mason Ind. & Vibration Mountings And Controls, who meet all the requirements of the specifications are acceptable.

1.02.2 Manufacturer responsibilities: Manufacturer of vibration and seismic control products shall have the following responsibilities:

1.02.2.1 Provide calculations to determine restraint loads resulting from seismic forces presented in North Carolina Building Code, 2012 Edition, Chapter 16. **Seismic calculations shall be certified by a licensed engineer in North Carolina in the employ of the seismic equipment manufacturer.**

1.02.2.2 Anchor bolt calculations, signed by a qualified licensed engineer, shall be submitted showing adequacy of bolt sizing and type. Calculations shall be furnished for anchors on **restraint devices, cables, and rigidly mounted equipment.** Calculations and restraint device submittal drawing shall specify anchor bolt type, embedment, concrete compressive strength, minimum spacing between anchors and minimum distances of anchors from concrete edges. Concrete anchor locations shall not be near edges, stress joints, or an existing fracture. All bolts shall be ASTM A307 or better.

1.02.3 Steel components shall be cleaned and painted. All nuts, bolts and washers shall be zinc-electroplated. Structural steel bases shall be thoroughly cleaned of welding slag and primed with zinc-chromate or metal etching primer.

1.02.4 All isolator bases and seismic restraints exposed to the weather shall utilize cadmium plated or PVC coated springs and hot dipped galvanized steel components. Nuts, bolts and washers may be zinc-electroplated. Isolators for outdoor mounted equipment shall provide adequate restraint for normal wind loads and withstand a minimum of 30 lb. / sq. Ft. applied to any exposed surface of the equipment.

1.03 SUBMITTALS:

The manufacturer of vibration isolation products shall submit the following data for each piece of isolated equipment: clearly identify type of equipment, quantity, and size of vibration isolators and seismic restraints, and rpm of each piece of rotating isolated equipment. Submittals for mountings and hangers incorporating springs shall include spring diameters, rated deflections, and spring free height. Submittals for bases shall clearly identify locations for all mountings, as well as all locations for attachment points of the equipment to the mounting base. Installation instructions shall be included. **Submittals shall include seismic calculations signed and checked by a qualified licensed engineer in the employ of the manufacturer of the vibrations isolators**. Catalog cut sheets shall be included for each type of isolation mounting or seismic restraint used on equipment being isolated.

END OF SECTION

23 80 50 - INSULATION

PART 1 - GENERAL

1.01. GENERAL:

Refer to Section 500 for General Requirements for mechanical work.

1.02 SCOPE OF WORK:

The Contractor shall cover all piping and apparatuses, as specified below, with insulation as manufactured by Johns-Manville, Owens-Corning or equal. All insulation, jacket, facing and adhesive shall have composite ratings not exceeding flame spread of 25 and smoke development of 50.

PART 2 - PRODUCTS:

2.01 DUCTWORK:

All supply, return and outside air ductwork shall be insulated with three quarter pound per cubic foot minimum density glassfiber blanket insulation having type FRK foil reinforced kraft vapor barrier jacket. Insulation shall be 2" thick, 3/4 pound per cubic foot minimum density glassfiber blanket insulation with jacket as specified above with a minimum R value of 5.0. Insulation shall be wrapped tightly on the ductwork with all circumferential joints butted and longitudinal joints overlapped a minimum of 2". Adhere insulation to metal with 4" strips of insulation bonding adhesive at 8" on centers. On longitudinal joints, the overlap shall be secured using 9/" flared door staples applied 6" on centers and taped with minimum 3" wide foil reinforced kraft tape. All pin penetrations or punctures in facing shall be taped. Tape all circumferential joints with 4" wide foil reinforced kraft tape.

2.02 DUCTWORK EXPOSED TO THE WEATHER:

Duct shall be insulated with 2” thick Dow extruded polystyrene board. All joints shall be taped and sealed. The above specified board shall be covered with 0.020 thick stucco embossed aluminum jacket. The jacket fasteners and hardware shall be stainless steel and all joints shall be sealed with silicon caulking.

2.03 CONDENSATE DRAIN PIPING:

Condensate drain piping from the unit to termination points(floor drains, hub drains) shall be insulated with ¾” thick armaflex insulation with all joints glued and taped.

2.04 ALUMINUM METAL JACKET:

All insulation outside shall be covered with .0 aluminum jackets secured with aluminum, strapping per manufacturer’s installation instructions.

2.05 DUCTWORK EXPOSED IN INTERIOR:

All exposed ducts in areas including mechanical rooms and storages shall receive rigid fiberglass board insulation with a layer of resin paper over jacket and finish with **fire retardant** 8 oz. canvas, and painted.

PART 3 - EXECUTION:

3.01 PROCEDURES:

3.01.1 All insulation shall be the product of reputable manufacturers and shall be applied by mechanics skilled in the use of various materials and in the employ of a concern regularly engaged in the insulating business. The materials shall all be applied in accordance with the published standards of the manufacturer of the materials, using any special materials as required by these specifications and by those published standards. Unsightly work shall be just cause for rejection.

3.01.2 All sectional covering shall finish round and smooth, without lumps or depressions and all end and joints shall butt evenly and tightly together and to the covered surface. No broken or damaged section shall be used. When covering is formed from blocks, they shall be carefully and evenly applied, securely wired in place and joints shall be closed with cement insulation.

3.01.3 In instances where insulated lines pass into other areas, wherein the line will not be insulated as described herein, the insulation shall not terminate at the wall, but shall extend full size a minimum of 1" beyond the wall.

3.01.4 Engage the services of a qualified insulation applicator to furnish and install all the insulation required for the mechanical equipment, piping, etc., specified herein.

3.01.5 All surfaces to be insulated shall be clean and dry before applying insulation. All sections of molded pipe covering shall be firmly butted together. No insulation shall be applied until the pipe, duct, etc., have been pressure tested and found tight. Piping flexible connections, flanges and unions shall not be covered unless specifically noted. Flexible connections on ducts shall not be covered.

3.01.6 Prior to the installation of any insulating material to ferrous piping systems, the piping surfaces shall be thoroughly cleaned of all mill scale, grease and dirt and shall be given a coat of rust inhabiting primer.

3.01.7 Where vapor barriers are required, the vapor barrier shall be on the outside. Extreme care shall be taken that the vapor barrier is unbroken. Joints, etc., shall all be sealed. Where insulation with a vapor barrier terminates, it shall be sealed off with the vapor barrier being continuous to the surface being insulated. Ends shall not be left raw.

END OF SECTION

23 80 60 - CLEANING AND TESTING

PART 1 - GENERAL:

1.01 GENERAL:

1.01.1 Refer to Section 23 00 10 for General Requirements for Mechanical Work.

1.02 SCOPE OF WORK:

1.02.1 This Contractor shall, at his own expense, during the progress of the work or upon its completion, make such tests of his work as are herein specified in accordance with all laws, governing authorities, or as are required by Engineer or by state or municipal bureaus having jurisdiction and under their supervision. The Contractor shall provide all apparatus, temporary piping connections or any other requirements necessary for such tests. He shall take all due precautions to prevent damage to building or its contents incurred by such tests, as he will be required to repair and make good, at his own expense, any damage so caused. Any leaks, defects or deficiencies discovered as a result of the tests shall be immediately repaired or made good and test shall be repeated until the test requirements are full complied with. No caulking of pipe joints to remedy leaks will be permitted.

1.02.2 No work of any nature shall be covered, enclosed or otherwise concealed until properly inspected, tested and approved. Any leaks which develop during any of the tests shall be corrected with new material and made as good as required; said tests shall be repeated until the work is satisfactory to Engineer and the mechanical inspectors in every way.

1.02.3 Each separate system with its various components shall be operated by this Contractor for a reasonable length of time to demonstrate the performance of all equipment and piping in accordance with the true intent and purpose of the plans and specifications. All necessary adjustments shall be made to the satisfaction of the Architect.

1.02.4 All motor driven equipment shall be proved operable generally in accordance with the intent of these specifications.

1.02.5 All electrical power and water for testing of air conditioning and/or heating equipment shall be provided by the Owner.

PART 2 - EXECUTION

2.01.1 Heating, Ventilating and Air Conditioning Systems: Each and every phase of the new air conditioning, heating and ventilating systems shall be operated separately, or in conjunction with the others for a period of time to demonstrate to the satisfaction of the Engineer the ability of the equipment to meet the capacity and performance requirements

while maintaining design conditions in accordance with the true intent and purpose of these specifications. Heating and cooling capacities and performance for every system shall be checked in the winter and summer, respectively. Any adjustments and/or startup required shall be done at no additional cost to the owner. Any adjustments done during one season shall not affect capacities and performance during the other season. The volume of air at each outlet and inlet, air conditioning equipment performance data, etc., shall be tabulated and required balancing performed by engineering personnel skilled, trained and experienced in the performance of these functions. Previous to such performance tests, this Contractor shall have set all valves, dampers, motors, controllers, thermostats, etc., and shall have the system operating and maintaining design temperatures, humidity and air circulation throughout all areas of the building. This Contractor shall also at the proper time make such additional adjustments as may be required to obtain consistent temperatures throughout the project.

END OF SECTION

23 80 70 - SYSTEM BALANCING AND ADJUSTING

PART 1 - GENERAL

1.01 GENERAL:

1.01.1 Refer to Section 23 00 10 for General Requirements for Mechanical Work.

1.01.2 The work described in this Section shall be performed by the Contractor.

1.02 SCOPE OF WORK:

1.02.1 This section covers the testing, balancing and adjusting of environmental systems including but not limited to: hydronic distribution systems and the equipment and apparatus connected thereto.

1.02.2 The work required herein shall consist of setting volume (flow) and speed adjusting facilities provided or specified for the system, recording data, making tests and preparing reports, all as hereinafter specified

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

3.01 PROCEDURES:

3.01.1 Environmental systems including all equipment, apparatus and distribution systems shall be tested and balanced in accordance with the latest edition of NEBB Procedural Standards for Testing - Balancing and Adjusting of Environmental Systems published by NEBB or Associated Air Balance Council (AABC).

3.01.2 Testing and balancing shall be done by an independent testing and balancing firm with at least two (2) years verifiable experience.

3.01.3 Instruments used for measurement shall be accurate and calibration histories for each instrumentation shall be available for examination.

3.01.4 Before receiving final approval, Contractor shall clean out all lines, adjust all valves, control items and other equipment, clean all pipe and equipment, and leave his installation complete and in good working order.

3.01.5 The Contractor shall be responsible for inspecting, adjusting, balancing and logging the data on the performance of fans, all dampers in the duct system, and all air distribution devices.

3.01.6 Final balancing, so that all areas of the building are at the same approximate temperature at the time of balancing, shall be done immediately after occupancy. Heating and cooling capacities and performance for every system shall be checked in the winter and summer, respectively. Any testing and/or adjusting required shall be done at no additional cost to the owner. Any adjustments done during one season shall not affect capacities and performance during the other season. Re-balance shall be done during the guarantee period as required by the Engineer.

3.01.7 Final adjustments shall be within ± 10% of design values. If this cannot be attained, the Engineer shall be notified in writing with an explanation.

3.02 REPORTS:

3.02.1 The final reports shall be submitted for review on forms similar to those suggested by the National Environmental Bureau or the American Air Balance Council. Each individual final reporting form submitted must bear the signature of the person who recorded the data and the signature of the Test-Adjust-Balance Supervisor of the performing firm. Forms shall be typed and submitted in three (3) hole soft back binders.

3.02.2 Identification of all types of instruments used and their last dates of calibration will be submitted with the final report.

3.02.3 Before final acceptance of the system is made, the contractor shall furnish to the Engineer the following data in five (5) copies:

A. A tabulation of simultaneous temperature (Dry bulb and wet bulb) of all spaces on each separately controlled zone for both the cooling and heating seasons.

B. A listing of measured air quantities at each outlet.

C. Air quantities at all return and exhaust devices.

D. The manufacturer model number and serial number of the rooftop units, recovery units, fans and unit heaters. List name plate full load amps, voltages, phase and actual running load amps, (voltage on each leg if 3 phase), horsepower, number of belts and model number of belts where appropriate, number of filters and filter sizes, burner input and output capacities.

Test and balance reports shall be completed, reviewed, and approved by the designer of record before submitting to SCO for request for Final Inspection and Occupancy Permit. Rough drafts of test and balance reports from the contractor will not be acceptable.

3.03 CLOSE OUT CERTIFICATES:

The Mechanical Contractor shall deliver to the Architect/Engineer, prior to or in conjunction with his request for final payment, the original and two (2) copies each of:

Inspection certificates previously herein specified.

Mechanical Contractor's letter of Guarantee.

Equipment manufacturer's warranties for rooftop units, heat recovery units, exhaust fans, etc.

Affidavit of Payment of Debts and Claims (Section 317).

Affidavit of Release of Liens (Section 316).

Consent of Surety to Final Payment (Section 318).

Letter certifying that all materials used on this project do not contain asbestos.

END OF SECTION

DIVISION 26 - ELECTRICAL

26 00 10 - GENERAL PROVISIONS

PART 1 - GENERAL

1.01 SCOPE:

The scope of the electrical phase of this project shall include all labor, materials, equipment, etc., required to fulfill the intent of the Contract Documents and shall include the work specified under the following sections:

SECTION 26 00 50 – BASIC MATERIALS AND METHODS
SECTION 26 40 00 – SERVICE AND DISTRIBUTION
SECTION 26 45 00 – GENERATOR MANUAL TRANSFER SWITCH
SECTION 26 50 00 – LIGHTING

1.02 RELATED DOCUMENTS:

All applicable provisions of Division 0 and 1 govern work under this division. Refer to these articles in the specifications for additional information.

1.03 REFERENCED STANDARDS:

1.03.1 All work shall be performed in accordance with the latest editions of the applicable state, national and local ordinances and building codes and in accordance with the National Electric Code.

1.03.2 Refer to each section for applicable codes and reference standards.

1.03.3 The provisions of the North Carolina Construction Manual shall apply to this project along with the requirements of the following agencies:

AEIC	American Association of Edison Illuminating Companies
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronic Engineers
NCCM	N.C. Construction Manual w/ G.S. as listed
NCSBC	N.C. State Building Code
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
U/L	Underwriters' Laboratories Inc.
OSHA	Occupational Safety and Health Standards

1.03.4 Below are THIRD PARTY AGENCIES ACCREDITED BY NCBCC TO LABEL ELECTRICAL & MECHANICAL EQUIPMENT. Strict adherence to this list is mandatory.

THIRD PARTY AGENCIES ACCREDITED BY THE NCBCC TO LABEL ELECTRICAL AND MECHANICAL EQUIPMENT AS OF MARCH 10, 2009

Applied Research Laboratories 5371 Northwest 161st Street Miami, Florida 33014 (305) 624-4800	Equipment Categories: 6, 8, 12, 14, 15, 18, 21, 22, 24, 31, and 43
CSA International 178 Rexdale Boulevard, Toronto, Ontario, Canada M9W IR3 (416) 747-2798	Equipment Categories: M9W IR3 All
Curtis-Straus 527 Great Road, Littleton, Massachusetts 01460 (978) 486-8880 x 296	Equipment Categories 7 & 26-28
Entela, Inc. 3033 Madison Avenue SE Grand Rapids, Michigan 49548 (616) 247-0515	Equipment Categories: 11, 12, 26, 27, 28, 29, 31, 40, 43, 47 & 48
Factory Mutual Research PO Box 9102 Norwood, Massachusetts 02062 (781) 762-4300	Equipment Categories: 4, 5, 9, 13, 17, 19, 24, 28, 48-51, 31, 32, 39, 43, 47
Intertek Testing Services ITS-ETL 3933 US Route 11 Cortland, New York 13045-2014 (607) 753-6711	Equipment Categories: All except 21
Intertek Testing Service ITS-Warnock 3933 US Route 11 Cortland, New York 13045-2014 (607) 753-6711	Equipment Categories: 17, 18, 21, 24 & 25
MET Laboratories 2200 Gateway Centre Blvd., Suite 215 Morrisville, NC 27560 (919) 481-9319	Equipment Categories: 7, 10, 11, 12, 13, 14, 15, 16, 22, 23, 26, 27, 28, 29, 30, 31, 37, 38, 39, 40, 43, 44, 47, 48 and 50

National Technical Systems (NTS)
533 Main Street
Acton, Massachusetts 01720
(978) 263-2933

Equipment Categories:
26, 27 & 28

Omni-Test Laboratories
PO Box 743
Beaverton, Oregon 97075
(503) 643-3788

Equipment Categories:
17, 18 & 21

PFS Corporation
2402 Daniels Street
Madison, Wisconsin 53718
(608) 221-3361

Equipment Categories:
17, 19, 20, 21 & Replacement
Blowers & coils

QPS Evaluation Services
81 Kelfield Street, Unit 8
Toronto, Ontario, Canada M9W 5A3
(416) 241-8857 x 422

Equipment Categories
6-12, 14-16, 22, 23, 26-29, 31, 36, 39,
40, 43, 46-48, 50 &51

RADCO
3220 East 59th Street
Long Beach, California 90805
(310) 272-7231

Equipment Categories:
17, 18 & Replacement
Blowers and coils

TUV America
65 T. W. Alexander Dr.
RTP, North Carolina 27709
(800) 888-0123

Equipment Categories:
4-8, 10-20, 22, 23, 26-29, 31, 35,
36, 38, 39, 43, 46-48 & 50

TUV Rheinland of North America
762 Park Avenue
Youngsville, North Carolina 27596
(919) 554-3668

Equipment Categories:
7-11, 12-16, 26-28, 31, 40,
43, 47 & 48

Underwriters Laboratories, Inc.
12 Laboratory Drive
RTP, North Carolina 27709
(919) 549-1400

Equipment Categories:
All

Wyle Laboratories
7800 Highway 20 West
Huntsville, Alabama 35806
(256) 837-4411 x 4125

Equipment Categories:
4, 26 & 43

EQUIPMENT CATEGORIES

1. Conductors for General Wiring.
2. Flexible Cords.
3. Wires and Cables for Special Applications.
4. Materials and Components for Special Applications.
5. Alarm Signal and Detecting System Components.
6. CATV and Radio Distribution System Components.
7. Communication System Components.
8. Radio and Television Components.
9. Energy Management System Components and Controllers.
10. Sound Recording and Reproduction Equipment.
11. Fixed Office Appliances and Business Equipment.
12. Electrical Appliances.
13. Electric Space Heating Equipment and Accessories.
14. Air Conditioning Equipment and Accessories.
15. Heat Pump Equipment and Accessories.
16. Refrigerant Equipment and Accessories.
17. Gas Fired Heating Equipment and Accessories.
18. Gas Fired Appliances.
19. Oil Fired Heating Equipment and Accessories.
20. Oil Fired Appliances.
21. Solid Fuel Heating Equipment.
22. Fans and Ventilators.
23. Filtering Equipment.
24. Duct Materials Including Dampers.
25. Chimneys and Vents.
26. Electrical Data Processing Equipment.
27. Medical, Dental, and X-Ray Equipment.
28. Laboratory Equipment, Electrical Measuring, and Testing Equipment.
29. Food Preparation Machines.
30. Swimming Pool and Spa Equipment.
31. Miscellaneous Fixed Equipment - Amusement Machines, Animal Care, Appliances, Battery Chargers, Cleaning Machines, etc.
32. Fire Extinguishing Equipment.
33. Circuit Breakers.
34. Fuses.
35. Wiring Devices, Attachment Plugs and Toggle Switches.
36. Switches and Switching Devices - Other than Toggle.
37. Panelboards.
38. Switchboards.
39. Transformers.
40. Electrical Signs and Accessories.
41. Ground-Fault Circuit Interrupters.
42. Ground-Fault Sensing and Relaying Equipment.

43. Industrial Control Equipment - Motor Controllers, Industrial Control Panels, Motor Control Centers, Motorized Valves, Solenoids, etc.
44. Transient Voltage Surge Suppressors and Filters.
45. Lightning Protection System Components and Lightning Protection Devices.
46. Metering Enclosures and Meter Sockets.
47. Emergency Lighting and Power Equipment System Components.
48. Lighting Fixtures, Lamp Holders, and Accessories.
49. Auxiliary Gutters, Junction, Pull and Outlet Boxes, and Cabinets and Cutout Boxes.
50. Electrical Equipment for Hazardous Locations.
51. Grounding and Bonding Equipment.
52. Wire Connectors, Lugs, and Terminal Fittings.
53. Insulating Tape and Closures.

1.04 FEES, PERMITS AND TAXES:

This Contractor shall make arrangements for and pay for all inspection fees and permits required by the local authorities. The Contractor shall also pay all taxes levied for labor and materials associated with work under this Division. It shall be the electrical contractor’s responsibility to notify the Office of Electrical Inspector, Department of Insurance, to schedule all required electrical inspections.

1.05 SUBMITTALS:

1.05.1 The symbol "<S>" indicates a requirement for submittals.

1.05.2 Shop drawings, manufacturer's data materials lists, etc., are required for all equipment and material where submittals are required.

1.05.3 Refer to "General Conditions" and/or "Instructions to Bidders" for additional information on submittals.

1.05.4 Submittals shall be presented from published manufacturer's data and in such a form that the Engineer can readily verify compliance with codes, standards, and the Contract Documents including construction features, rough-in requirements, etc. Each submittal shall contain data relevant to the particular equipment (including options). The data shall be identified by "hy-liteing", arrows, underlining, etc. Do not submit pages of non-relevant information. Broad general data is not acceptable. If equipment submitted is not as specified in the Contract Documents, then the submittal shall contain specific details prominently identifying any differences in form, fit or function. This contractor is responsible for any additional costs arising from any substitution of any item.

1.06 OPERATING AND MAINTENANCE MANUALS AND INSTRUCTIONS:

1.06.1 The symbol "<OM>" indicates that operating and maintenance manuals are to be furnished.

1.06.2 Each operating and maintenance manual shall apply specifically to the equipment installed. In those cases where one manual covers a general class of equipment, the contractor shall be required to identify (hy-liteing, underlining, etc.) those portions which apply to the installed equipment. All operating and maintenance manuals shall be available for inspection by the Architect/Engineer at the final inspection.

1.06.3 Provide (3) three copies of operating and maintenance manuals. Manuals shall be bound in large ring loose-leaf binders and contain the following:

a. Manufacturer's instructions and/or installation manual.
b. Additional items that may be required in Division 1.

1.07 PRIOR APPROVAL:

Where the contractor wishes to substitute equipment or materials under an "or equal" clause, he shall submit to the Engineer in writing seven (7) calendar days prior to bid opening lists of proposed substitutions which, from published manufacturer's data, cover the salient features of the proposed substitution. Approvals will be issued in writing.

1.08 DEFINITIONS: The following words and phrases are hereby defined:

1.08.1 "provide": Furnish and install all material and labor required for a complete installation ready for operation in accordance with the intent of the Contract Documents.

1.08.2 "as required": Indicates that the contractor shall perform the work or provide the material as indicated in accordance with manufacturer's installation instructions and in accordance with applicable codes or regulations.

1.08.3 "or equal": Indicates that the contractor may substitute equipment by another manufacturer if the salient features of the equipment indicated by manufacturer's name and/or described are, in the judgment of the Architect, adequate. See article PRIOR APPROVAL.

1.08.4 "contractor": Where the word(s) "contractor" or "this contractor" is used herein it refers to the contractor engaged to execute the work under this division of the specifications only, even though he may be technically described as a sub-contractor.

1.08.5 "Intent of the Contract Documents": The specific intent of these documents is to provide to the owner, in a thoroughly functional condition, all the various systems, equipment, etc., indicated herein. Final interpretation of the "intent" shall rest with the Engineer.

1.08.6 "shall": Indicates a mandatory requirement.

1.09 INSPECTION OF THE SITE:

1.09.1 The drawings are prepared from the best information available and reflect all conditions commensurate with this information. However, the contractor should visit the site prior to submitting a proposal and should verify the locations, sizes, depths, pressures, etc., of all existing utilities and familiarize himself with working conditions, hazards, existing grades, soil conditions, obstructions, etc. If it becomes evident that existing site conditions will impair the proper operation of the utilities, the Architect shall be notified in writing.

1.09.2 All proposals shall take these existing conditions and any revisions required into consideration, and the lack of specific site information on the drawings shall not relieve the contractor of any responsibility

1.10 CONSTRUCTION SAFETY:

This Contractor assumes all responsibility for the safety of his personnel on the project during construction. The Contract Documents do not include materials, procedures, components, etc., required to insure construction safety. Refer to General Conditions for additional information.

1.11 DAMAGE:

1.11.1 This Contractor shall be responsible for damage to the project caused by this Contractor's failure to recognize hazards associated with items such as lack of power, scheduling of work (tardiness), inexperienced workmen, excessive cutting, etc.

1.11.2 This Contractor shall repair at no expense to the owner any such damage.

1.11.3 This Contractor shall familiarize himself with working conditions to the extent that he shall be responsible for damage to concealed piping, wiring and other equipment meant to remain, and shall repair any damage caused by his negligence at no cost to the owner.

PART 3 - EXECUTION

3.01 WORKMANSHIP:

3.01.1 All work shall be done by experienced craftsmen skilled in the applicable trade.

3.01.2 Unprofessional and incomplete work shall be rejected and corrected at no additional expense.

3.02 MANUFACTURER'S INSTALLATION INSTRUCTIONS:

3.02.1 All equipment shall be installed in strict compliance with manufacturer's installation instructions.

3.03 PROTECTION OF EQUIPMENT:

3.03.1 The Contractor shall continuously maintain adequate protection of stored materials and installed equipment. Fixtures and equipment, whether located inside or outside, shall be tightly covered with sheet polyethylene or waterproof tarpaulin as protection against dirt, rust, moisture and abuse from other trades. Adequate air circulation shall be provided under any protective sheet to prevent condensate build up. Materials and equipment shall not be stored directly on the ground.

3.03.2 Ductwork, piping, conduit and equipment shall not be used by other trades as supports for scaffolds or personnel. At the completion of the work, equipment, fixtures, exposed supports and piping shall be cleaned of loose dirt, construction debris, overspray, etc., to the satisfaction of the Engineer. Repairs made necessary by damage shall be paid for by the Contractor.

3.03.3 All equipment and conduit furnished and installed under this contract shall be seismically restrained as required by Chapter 16, STRUCTURAL DESIGN, in the North Carolina State Building Code, 2012 Edition, with specific attention to Section 1613, EARTHQUAKE LOADS. These seismic load provisions are also required in Chapter 13 of the American Society Civil Engineers' publication ASCE 7, 2005 Edition. The Electrical Contractor shall include in his/her bid price the cost to accomplish all requirements of the aforementioned code.

3.04 CONFLICTS, INTERFERENCES AND COORDINATION BETWEEN TRADES:

3.04.1 The drawings are not to be construed as shop drawings but indicate the extent, general locations, arrangement, etc., of conduit systems and equipment. If the contractor has any questions regarding the layout of a particular device or equipment item he shall contact the architect for clarification. This Contractor shall, in laying out his work, refer to other sections of the specifications and other drawings such as air conditioning, structural, plumbing, architectural, etc., in order to eliminate conflicts and undue delays in the progress of the work. See article CUTTING AND PATCHING for additional coordination required. Where items are furnished by other trades require connections by this Contractor, they shall be held responsible for providing rough-in drawings and assistance upon request.

3.04.2 All work shall be closely coordinated with other trades. Failure to do so could result in the relocation of installed work of the contractor at fault at his/her own expense.

3.04.3 In the event of interferences, piping or equipment requiring set grades or elevations shall have precedence over conduit, lighting, outlet boxes, air conditioning, ductwork, etc.

3.04.4 In the event of conflicts between specifications and drawings, specifications shall take precedence over drawings.

3.04.5 In the event of conflict between codes as interpreted by the authority having jurisdiction, and the contract documents, the codes shall govern.

3.04.6 In the event of a conflict between manufacturer's installation instructions and the drawings, the manufacturer's installation instructions shall govern.

3.04.7 In all events, the intent of the Contract Documents shall govern. Minor conflicts and interferences shall, wherever possible, be worked out on the project. Major conflicts shall be referred to the Architect for solution.

3.04.8 Where electrical wiring is required by trades other than covered by Division 26, the installer shall refer to the wiring materials and methods as specified under Division 26, No Exceptions.

3.05 CUTTING AND PATCHING:

3.05.1 All cutting required by the installation of sleeves, conduit, equipment, etc., shall be coordinated with the General Contractor, but performed by this Contractor. Patching shall be by General Contractor. This Contractor shall not cut any structural element or any finished work without written permission from the Architect.

3.05.2 This Contractor shall cut and patch all paving/concrete as required by the installation of buried conduit or wire.

3.06 PAINTING:

3.06.1 All painting except "touch-up" shall be provided under the painting section (Division 9) unless noted otherwise. All exposed conduit, equipment, etc., shall be left clean and free from rust or grease and ready for the painter.

3.06.2 Where equipment finishes are damaged, this Contractor shall obtain touch-up paint in matching colors from the equipment manufacturer and paint as required.

3.07 DIVISION OF WORK:

3.07.1 All individual motor starters and drives for mechanical equipment (fans, pumps, etc.) shall be furnished and installed under Division 23, except where noted differently on the plans.

3.07.2 Division 26 is responsible for providing power wiring up to a termination point adjacent to mechanical equipment. This termination point may consist of a junction box, starter, drives, disconnect switch, etc. Line side termination to this equipment shall be supplied by the electrical contractor. Wiring from the termination point to the mechanical equipment, including final connections, shall be provided under Division 23.

3.07.3 Duct smoke detectors shall be furnished and wired by Division 26, installed by Division 23. Shut down circuits shall be wired from the fire alarm control panel to a termination point, adjacent to the AHU control, under Division 26. AHU control wiring from the termination point to the equipment shall be under Division 23.

3.07.4 All relays, actuators, timers, and miscellaneous other devices associated with equipment under Division 23 shall be furnished, installed and wired under Division 23.

3.07.5 All control wiring shall be by Division 23.

3.07.6 All roof exhaust fan motors shall be wired to built-in disconnects provided under Division 23, except where noted differently on the plans.

3.07.7 All control and interlock wiring shall be performed by the respective contractors, except where noted on plans.

3.08 FLASHING AND WATERPROOFING:

All building penetrations to the outside shall be flashed and counter-flashed as required to eliminate leaks.

3.09 TESTS:

See Section 26 00 50 for required tests.

3.10 CLEAN-UP:

Where all work has been finally tested, this Contractor shall clean all work installed by him, including all fixtures, equipment, and all exposed work.

3.11 SCHEDULE OF ALTERNATES:

On the Bid Form in the proper locations, state the dollar amounts to be added to or deducted from the Base Bid amount if the alternate bid work is accepted by the owner. Write in the words “Add” or “Deduct” as appropriate along with the amount quoted. Write in the words "No Change" if there will be no change in the Base Bid contract amount if the alternate bid is accepted.

Add Alternate #1- Construct 1000 sq.ft. Tire Storage Building as shown on Sheet S6, A8.0 and PME-1, with 10’ wide concrete apron as shown on C2.0.

Add Alternate #2- delete 4” of gravel at Area 1, leaving 2” gravel base. Pave Area 1 (front of Shop) as shown on Civil drawings.

Add Alternate #3- delete 4” of gravel at Areas 1 and 2, leaving 2” gravel base. Pave Area 1 (front of Shop) and Area 2 (side driveways) as shown on Civil drawings.

Add Alternate #4- delete 4” of gravel at Areas 1, 2 and 3, leaving 2” gravel base. Pave Area 1 (front of Shop), Area 2 (side driveways), and Area 3 (back of Shop) as shown on Civil drawings.

END OF SECTION

26 00 50 - BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SCOPE:

Work of this Section shall include specification of electrical devices to be used in subsequent sections and shall include the following principal items:

Raceways
Wires and Cables
Outlet and Junction Boxes
Wiring Devices
Device Plates
Mounting Heights
Identification and Nameplates

1.02 REFERENCED STANDARDS

NFPA 70 - National Electrical Code
NFPA 101 - Life Safety Code

PART 2 - PRODUCTS

2.01 ABOVE GROUND RACEWAYS:

2.01.1 All wiring indicated including power wiring, emergency systems wiring (NEC Article 700), temperature control wiring, communication wiring where indicated, etc., shall be in separate raceways. All wiring shall be in raceway. BX, MC, AC, NM and other cable assemblies shall not be used.

2.01.2 Flexible metal conduit may be used for final connections to recessed lighting fixtures and shall be used for final connections to motors and transformers. Maximum length permitted is 72 inches. Use "liquid-tight" type for outdoor installations.

2.01.3 Conduit shall be sized in accordance with the latest edition of the NEC unless shown otherwise, with minimum conduit size being 1/2 inch. Flexible metal and watertight ("sealtite") conduit in sizes 1/2 inch and larger are acceptable for motor, appliance and fixture connections provided green wire is installed and NEC is followed.

2.01.4 Conduit, exposed and concealed (except "in slab" conduits), shall be neatly installed parallel to, or at right angles to beams, walls and floors of buildings.

2.01.5 Conduit types may be utilized as permitted by the NEC, with the following restrictions:

a. EMT shall not be installed where tubing, couplings, elbows and fittings would be in direct contact with the earth; underground (in/below slab-on-grade or in earth); or any location where the tubing, etc., would be exposed to the elements. EMT shall not be installed indoors in wet or damp locations or in concrete, cinder blocks or brick.

b. EMT shall not be installed where exposed to severe corrosive influence.

c. EMT shall not be installed where exposed to severe physical damage.

2.01.6 The raceway system shall not be relied upon for grounding continuity.

2.01.7 The use of “LB’s” shall be limited where possible. Where necessary to use “LB’s” sized above 2 inch, mogul units shall be installed.

2.01.8 PVC Schedule 40 shall not be used.

2.01.9 Metal surface raceways equal to Wiremold shall be used at existing construction where concealment is impractical. Acceptable manufacturers: Wiremold, Panduit and National.

2.02 UNDERGROUND RACEWAYS:

2.02.1 Raceways run external to building foundation walls, with the exception of branch circuit raceways, shall be encased with a minimum of three (3) inches of concrete on all sides.

a. Encased raceways must have a minimum cover of eighteen (18) inches, except for raceways containing circuits with voltages above 600 volts, which must have a minimum cover of thirty (30) inches.

b. Encased raceways shall be of a type approved by the NEC as "suitable for concrete encasement."

2.02.2 Branch circuit raceways run underground external to building foundation walls shall be run in raceways installed in accordance with the NEC, and shall be of a type approved by the NEC as "suitable for direct burial." Minimum raceway size shall be 3/4 inch.

2.02.3. All underground raceways shall be identified by underground line marking tape located directly above the raceway at 6 to 8 inches below finished grade. Tape shall be permanent, bright-colored, continuous printed, plastic tape compounded for direct burial not less than 6 inches wide and 4 mils thick. Printed legend shall be indicative of general type of underground line below.

2.02.4. Raceways run underground internal to building foundation walls shall be of a type and installed by a method approved by the NEC.

2.02.5. At all locations where underground raceways are required to turn up in the slab, including poles bases, the elbow required and the stub-up out of the slab or earth shall be of rigid steel.

2.02.6. The raceway system shall not be relied on for grounding continuity.

2.02.7. Where passing through a "below grade" wall from a conditioned interior building space, raceways shall be sealed utilizing fittings similar and equal to OZ/GEDNEY type "FSK" thru-wall fitting with "FSKA" membrane clamp adapter if required.

2.03 TERMINATION

2.03.1 IMC and GRC shall terminate with either a double locknut/bushing set, or in a threaded hub.

2.03.2 Where concentric, eccentric or over-sized knockouts are encountered, a grounding-type insulated bushing shall be provided.

2.03.3 EMT terminations shall be made utilizing steel-plated hexagonal compression connectors of the insulated throat type. NO POT METAL or INDENTED type fittings shall be utilized.

2.04 CONDUIT COUPLINGS

2.04.1 Where conduits of any type pass over a building expansion joint, a standard "expansion joint fitting", compatible with the type raceway in use, shall be provided.

2.04.2 Conduit couplings for IMC, GRC and PVC shall be in accordance with NEC.

2.04.3 EMT couplings shall be of the plated steel hexagonal compression type. No pot metal, set screw or indented type couplings shall be utilized.

2.05 BUILDING WIRES AND CABLES (600 VOLTS AND LESS)

2.05.1 Provide all wiring as indicated and/or required to each piece of equipment, wiring device, lighting fixture, etc. Provide control/interlock wiring as described in Section 26 00 10.

2.05.2 All wire sizes specified shall be in accordance with and designated by AWG (American Wire Gauge).

2.05.3 Copper conductors equal to Anaconda, Phelps-Dodge, Southwire or General Electric shall be used throughout unless specifically noted otherwise. The design is

based on copper conductors only.

2.05.4 No aluminum conductors may be used on this project.

2.05.6 Color coding of conductor insulation shall be uniform throughout the project. The secondary service, feeders and branch circuits shall be color coded as follows:

	120/208 volts	277/480 volts
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Natural Gray
Ground	Green	Green

No other colors may be used for branch circuits. Main feeders must be taped at panelboard terminations. From left to right, the first bus in each panel shall be phase "A", middle "B", and right bus "C".

2.05.7 All wire and cable shall be listed by an approved third party testing agency.

2.05.8 Conductors

a. Power and lighting circuits #10 AWG and smaller shall have solid copper conductors. Conductor sizes #8 AWG and larger shall have Class B stranded conductors.

1. Fire alarm and control wiring shall have stranded copper conductors.

b. The minimum conductor size for all power and lighting circuits shall be #12 AWG. The maximum conductor size allowed shall be 500 kcmil.

1. Fire alarm and control wiring shall be #14 AWG minimum.

2.05.9 Insulation

a. The insulation type for interior wiring shall be dual-rated THHN/THWN.

2.05.10 Voltage Drop

a. Where conductor lengths from the panel to the first outlet on a 277v circuit exceeds 125 feet, the branch circuit conductors form the panel to the first outlet shall not be smaller than #10 AWG.

b. Where the conductors length from the panel to the first outlet on a 120v circuit exceeds 50 feet, the branch circuit conductors from the panel to the first outlet shall not be smaller than #10 AWG.

2.05.11 Splicing

a. Joints in solid conductors shall be spliced using Ideal "wirenuts", 3M Company "Scotchlock" of T&S "Piggy" connectors in junction boxes, outlet boxes and lighting fixtures.

b. "Sta-kon" or other permanent type crimp connectors shall not be used for branch circuit connections.

c. 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.

d. Conductors, in all cases, shall be continuous from outlet to outlet and no splicing shall be made except within outlet or junction boxes, troughs and gutters.

2.06 OUTLET AND JUNCTION BOXES:

2.06.1 Provide metallic galvanized boxes per the N.E.C. at each outlet location indicated on the drawings or as required.

2.06.2 Boxes at exterior locations shall be cast aluminum with threaded hubs and gasketed in-use type covers.

2.06.3 The owner reserves the right to make minor adjustments to the locations of outlet boxes prior to rough-in.

2.06.4 Sizes and configuration of boxes shall be as required for the intended service and shall conform to and be applied in accordance with the N.E.C. Provide extension rings, expandable bars sets, supports, gaskets for weatherproof type, where required. Boxes shall be equal to Steel City with "CV" bracket or equal by Thomas & Betts or Arlington.

2.06.5 Gang type boxes shall be used where multiple wiring devices are located adjacent to one another, including cast in floor boxes.

2.06.6 Junction boxes shall not be installed above gypsum board ceilings or any location that is not accessible. If the conditions are such that this can not be avoided, the architect shall be notified for approval and this contractor shall supply and install all access panels as required for access to the junction box in question.

2.07 WIRING DEVICES

2.07.1 General: Provide wiring devices as indicated on drawings. Device color shall be

ivory unless otherwise indicated. Each type of device on the project shall be of the same manufacturer and catalog number throughout.

2.07.2 Toggle Switches

a. 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, heavy duty, specification grade, AC only. Lighted handle switches shall have neon lights of the correct voltage rating where indicated on the drawings.

b. All switches shall have quiet operating mechanisms without the use of mercury switches. The type switch shall be indicated on the drawings.

Single pole	- Hubbell HBL221
Double pole	- Hubbell HBL1222
3-way	- Hubbell HBL1223
4-way	- Hubbell HBL1224
Pilot light	- Hubbell HBL1221-PL

Acceptable manufacturers: Arrow Hart, Bryant, G.E., P & S, Hubbell, Cooper

2.07.3 Duplex receptacles:

a. 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. WDI.101968. 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.

b. Receptacles shall be industry heavy duty, specification grade, and be mounted vertically. Receptacles mounted over counters, back-splashes, etc., shall be mounted horizontally.

c. Provide the following and verify mounting height on site with GC & Architect.

Standard	Hubbell HBL5352
Ground fault	Hubbell GF5362
Clock hanger	Cooper 93632 SS plate w/recessed receptacle and integral clock hook.

Acceptable manufacturers: Arrow Hart, Bryant, G.E., P&S., Hubbell, Cooper

2.08 DEVICE PLATES

2.08.1 Cover plates for flush mounted wiring devices and for telephone outlets shall be

type "302" stainless steel, standard size, single or ganged as shown on the drawings. Cover plate mounting screws shall be tamper proof screws and shall match the finish and material of the plate, and shall be furnished with the plate by the plate manufacturer. Quantity of 2% spare cover plates of each type shall be provided to the owner.

2.08.2 Switch and receptacle cover plates on exposed work shall be galvanized cast ferrous metal of Feraloy, standard size, and shall be single or ganged as indicated on drawings.

2.08.3 Exterior mounted switch and receptacle plates, and those noted to be weatherproof, PVC cover plates, standard size, single or ganged as indicated on the drawings, and shall be "approved" as "raintight while in use".

2.08.4 Plates on surface mounted boxes not used in conjunction with surface metal raceway system shall be galvanized steel with 1/2" raised face and rounded edges.

2.08.5 Single multi-gang device plates shall be used where multiple devices occur.

2.08.6 Sectionalized plates will not be acceptable.

2.09 SUPPORTING DEVICES:

2.09.1 Conduit shall be supported in a method and at a spacing as approved by the NEC, except as described herein.

2.09.2 Conduit shall be supported by approved pipe straps or clamps.

a. Conduits installed on the interior of exterior building walls shall be spaced off the wall surface a minimum of 1/4 inch using "clamp-backs" or strut.

2.09.3 Pipe straps or clamps shall be secured by means of:

a. Toggle bolts on hollow masonry.

b. Metal expansion shields and machine screws, or standard pre-set inserts, on concrete or solid masonry.

c. Machine screws, or bolts on metal surfaces.

d. Wood screws on wood construction.

e. Power actuated (Ramset) fasteners are not allowed for use in securing pipe straps or clamps.

2.10 MOTOR AND CIRCUIT DISCONNECTS: <S>

2.10.1 Provide safety switches at each location indicated on the drawings or required by code. Switches shall be rigidly supported and properly aligned. Switches shall be equal to Square "D" type HD.

a. Switching mechanism shall be quick-make, quick-break mechanism with handle as integral part of the box. All current carrying parts shall be electroplated.

b. Enclosures shall be NEMA 1 for interior locations and NEMA 3R for exterior locations, and shall be of code gauge steel (galvanized for NEMA 3R) with baked enamel finish and shall have locking hasp.

c. Ratings, fusing provisions, poles, etc., shall be as indicated.

d. Safety switches shall be the "heavy duty" type. General duty switches are not acceptable.

e. Safety switches shall be third-party listed.

f. Switches shall have defeatable door interlocks that prevent the door from opening when the operating handle is in the "on" position.

g. Switches shall have handles whose positions are easily recognizable in the "on" or "off" position. Padlock shall be provided for switches located in public areas.

h. Switches shall have non-teasible, positive, quick make-quick break mechanisms.

i. Switches shall be properly labeled. See Article 3.05 of this Section, Electrical Identification.

2.10.2 General-use snap switches suitable only for use on AC shall be provided to disconnect 120, 208 or 240 volt motors, 2 horsepower or less where indicated. Switch ampere rating shall be 125% of motor full-load current.

2.10.3 Manual Motor Switches shall be provided as indicated. Units shall have NEMA 1 surface mounted enclosures unless otherwise indicated. Switches not located adjacent to equipment served shall have pilot lights. Devices shall be equal to Sq D type KG-1/2.

2.10.4 Refer also to Section 26 00 10, article 3.07 for division of work between Division 23 and Division 26 trades.

Acceptable manufacturers: Square D, General Electric, Cutler Hammer, and Siemens.

2.11 GROUNDING AND BONDING:

2.11.1 Grounding conductors, where insulated, shall be colored solid green. Conductors intended as neutral shall be colored solid white on 120/208 volt circuits and neutral gray on 277/480 volt circuits.

2.11.2 The raceway system shall not be relied upon for ground continuity. A green grounding conductor, properly sized per NEC Table 250-122, shall be run in ALL raceways. Exceptions are as follows:

a. Raceways for telecommunications.

b. Raceways for data.

c. Raceways for audio conductors.

2.11.3 Boxes with concentric, eccentric or over-sized knockouts shall be provided with bonding bushings and jumpers. The jumper shall be sized per NEC Table 250-122 and lugged to the box.

2.11.4 As part of Alternate #1, a rigid metallic conduit (RMC) with an outside PVC coating shall be installed for the power feeder to the Tire Storage Shop from the MDP.

PART 3 - EXECUTION

3.01 RACEWAYS:

3.01.1 Raceways shall be installed neatly racked, routed parallel or perpendicular to building lines, securely attached and supported. Installation shall conform to applicable sections of N.E.C. Article 342 through 360.

3.01.2 Concealed raceway shall be supported with galvanized stamped steel clamps secured to structure. Conduit shall not be used to support other conduit. Exposed raceways shall be secured to structure with galvanized stamped steel clamps or suspended from structure with beam clamps and conduit hangers.

Grouped raceways shall be supported with galvanized steel channel assemblies equal to Kindorf B-909 and single-bolt straps equal to Kindorf C-105.

Acceptable manufacturers: Unistrut, Power Strut, Globe Strut.

Raceway supports shall be spaced as follows:

a. rigid metal, IMC or EMT - within 3' of termination or connection & 10' on ctr.
b. rigid nonmetallic - per NEC paragraph 352.3.

c. flexible nonmetallic - per NEC paragraph 356.3.

3.01.3 Raceways shall be concealed where possible in finished areas, and may be exposed in mechanical/electrical equipment rooms.

3.01.4 Provide expansion fittings in all conduits crossing an expansion joint. Fittings shall be O.Z. type "EX" for rigid metal conduit or IMC, and O.Z. type "TX" for EMT. Metallic conduit not containing a grounding conductor shall have O.Z. type "BJ" bonding jumpers installed across expansion joists.

Acceptable manufacturers: Burndy, ITT Blackburn, Thomas & Betts, Anderson.

3.01.5 Pull boxes shall be provided as required for long runs and where excessive turns are encountered.

3.01.6 Grade raceways away from service entrance equipment to prevent water damage.

3.01.7 All conduit penetrations through fire rated ceilings, walls or floors shall be fire stopped using approved materials to maintain the fire rating of the ceiling, wall or floor structure. All penetrations through smoke portions shall also be sealed using approved materials.

3.02 WIRES AND CABLES:

3.02.1 All splices, taps, connections, terminations, etc., shall be made with appropriate connectors in a workmanlike manner and in compliance with the N.E.C.

3.02.2 All home runs shall be #12 or larger as indicated. No wire smaller than #12 shall be permitted serving lighting or outlets. Also refer to Article 2.05.10 of this section.

3.02.3 Provide suitable split-wedge cable supporting devices in each conduit riser, as required to properly support vertical cables.

3.03 OUTLET AND JUNCTION BOXES

3.03.1 Outlet and Junction Boxes shall be installed in a workmanlike manner, rigidly supported and properly aligned. Unless otherwise noted, boxes shall be flush with finished surfaces.

3.03.2 In masonry walls, rough-in boxes at joints.

3.03.3 Do not rough-in boxes back-to-back.

3.04 MOUNTING HEIGHTS:

Wiring devices & other equipment shall, unless noted otherwise, be mounted as follows:

Fire alarm signals:	Minimum 80" above floor to the bottom, maximum 96” above floor to the top of the device. Verify on-site with Architect.
Fire alarm stations:	4'-0" above floor on center.
Receptacles:	18" above floor or 6" above working surface on center unless noted otherwise on plan.
Switches:	4'-0" above floor on center (OC).
Data / Telephone outlets:	Same as receptacles. Wall phones at 54” above floor OC.
Panelboards:	6'-6" to the top of the panelboard above finished floor.

3.05 IDENTIFICATION AND NAMEPLATES:

3.05.1 Furnish and install engraved laminated phenolic “bakelite” nameplates for all safety switches, panelboards, transformers, switchboards, motor control centers and other electrical equipment supplied for the project. The nameplate shall identify the equipment, how it is controlled, where it is served from, phase, voltage, etc. Nameplates shall be securely attached to equipment with self-tapping stainless steel screws, and shall identify equipment controlled, attached, etc. Letters 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

3.05.2 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 and outlet.

3.05.3 All outlet boxes, junction boxes and pull boxes shall have their covers and exterior visible surfaces painted with colors to match the surface color scheme outlined above. This includes covers on boxes above lift-out and other type accessible ceilings.

3.06 ELECTRICAL TESTING:

3.06.1 FEEDER INSULATION RESISTANCE TESTING

a. All current carrying phase conductors and neutrals shall be tested as installed, and before connections are made, for insulation resistance and accidental grounds. This shall be done with a 500 volt megger. The procedures listed below shall be followed:

1. Minimum readings shall be one million (1,000,000) or more ohms for #6 wire and smaller, 250,000 ohms or more for #4 wire or larger, between conductors and between conductor and the grounding conductor.

2. 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 least 250,000 ohms from the neutral bar to the grounded panel can be achieved with only the neutral feeder disconnected.

3. 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.

4. At final inspection, the contractor shall furnish a megger and show the engineer that the panels comply with the above requirements. He shall also furnish a hook-on type ammeter and a voltmeter and take current and voltage readings as directed by the representatives.

3.06.2 DOCUMENTATION

a. All tests specified shall be completely documented indicating time of day, date, temperature and all pertinent test information.

b. At final inspection, the contractor shall furnish a megger and show the engineer's representative that the panels comply with the above requirements. He shall also furnish a hook-on type ammeter and a voltmeter, taking current and voltage readings as directed by the engineer.

c. All required documentation of readings indicated above shall be submitted to the engineer prior to, and as one of the prerequisites for, final acceptance of the project.

END OF SECTION

26 40 00 - SERVICE AND DISTRIBUTION

PART 1 - GENERAL

1.01 SCOPE:

Work of this Section shall be in accordance with the intent of the Contract Documents and shall include the following principal items:

Service
Service Equipment
Duct Bank
Panelboards
Equipment Grounding
Fuses
Surge Protection Device (SPD)
Electrical Load Balancing

1.02 REFERENCED STANDARDS:

NFPA 70 - National Electrical Code
NFPA 101 - Life Safety Code

PART 2 - PRODUCTS

2.01 SERVICE

The new service for the building will be a 600 amp, 208Y/120 volt, 3-phase, 4-wire delivery. The new utility pad-mounted transformer will be located a minimum distance of 20’-0” from the building. This distance complies with the distance requirement from the building of 20’-0” if the transformer is 300KVA or less (maximum of 200 kVA for this facility) and 30'-0" if the unit is more than 300 KVA. The Electrical Contractor shall install the secondary conductors underground in conduit encased in 3” of concrete from the new utility transformer to the service entrance Main Distribution Panel of the Equipment Shop. The Electrical Contractor shall supply facility load information to the electric utility and coordinate all aspects of the service installation with the utility. Load information shall be provided to the utility at the beginning of the project to ensure no problems are encountered.

2.02 SERVICE EQUIPMENT <S>

Square D "HCP I-Line" and "NQOD" panel boards were used as the basis for this design. The contractor is cautioned that space for electrical equipment is limited and attention should be given to size of the equipment included in their pricing.

Acceptable manufacturers: Square D, General Electric and Siemens.

2.02 DUCT BANK

Excavation and backfill shall conform to "Division 2" of the specifications except heavy-duty, hydraulic-operated compaction equipment shall not be used. Trenches shall be cut neatly and uniformly, sloping uniformly to required pitch. Ducts shall be pitched to drain away from buildings and equipment. Minimum slope shall be 4 inches in 100 feet. Concrete encased nonmetallic ducts shall be supported on plastic separators coordinated with duct size and spacing. Separators shall be spaced close enough to prevent sagging and deforming of ducts. Separators to the earth and to ducts shall be secured to prevent floating during placement of concrete. Steel or tie wires shall not be used in such a way as to form conductive or magnetic loops around ducts or duct groups. Waterproof marking cord shall be installed in all ducts, including spares, after thoroughly rodding, cleaning and swabbing all ducts free of any and all obstructions. The marking cord shall be 130-pound tensile test (marked at least every foot), equivalent to Greenlee No. 435. All ducts shall be sealed at terminations, using sealing compound and plugs, as required to withstand 15-psi minimum hydrostatic pressure. The installation of conduit in ductbanks should be in accordance with OSHA requirements.

2.03 PANELBOARDS <S>

2.03.1 Provide panelboards rated and sized as indicated in the schedule and shown on the plans equal to Square D Company Model NQOD for services up to 240 volts; Model NEH for services up to 480 volts; and "I-Line" for power distribution panels.

2.03.2 Construction features shall include minimum 5" wide gutters, dead front construction, electroplated current carrying parts; UL listed terminals suitable for conductors specified; flush front hinged “door-in-door” construction with cylinder tumbler type locks (all keys alike); circuit directory and frame, code gauge steel, galvanized and baked enamel finish.

2.03.3 Circuit breakers shall be bolt-on type QOB (NQO panelboards), type EHB (NEH panelboards), and type FY and FA (I-line panelboards). Breakers shall be toggle action with quick-make, quick-break mechanism. Trip indication shall be by breaker handle taking a position between ON and OFF. All multi-pole breakers shall be common trip with a single handle. Minimum interrupting rating of breakers shall be as indicated.

2.03.4 Panelboards and fused disconnects identified for use as service equipment shall be labeled as service equipment. Panel bus bars shall be copper. A typed directory card shall be supplied with each panel and it shall be mounted on the door interior. The directory shall indicate what each circuit powers to include room names and specific equipment. Load centers are not acceptable. G.E. Type "A" panels shall be provided with screw covers.

Acceptable manufacturers: Square D, General Electric and Siemens.

2.04 EQUIPMENT GROUNDING

The electrical equipment in the new building shall be grounded per NEC 250.32 and as follows.

a. To the metallic cold water pipe.

b. To the steel frame of the building, provided the building frame is effectively grounded.

c. To ground rods (min. of 2). Ground rods shall be 10 feet long and 3/4 inch in diameter, and shall be of copper-clad steel construction. All ground connections shall be accessible.

d. To the concrete encased electrode (footing rebar).

Refer also to testing requirements listed in 3.03 of this section.

2.05 FUSES (600 VOLTS OR LESS <S>

2.05.1 Fuses shall be so selected as to provide a fully selective system.

2.05.2 The following criteria shall be followed for fuse selection:

CIRCUIT TYPE	FUSE TYPE
Service Entrance & Feeder Circuits 600A & less	Class RK1 or J U/L listed, current limiting with 200K Amp interrupting rating.
Motor, motor controller & Transformer circuits	Class RK5 U/L listed, current limiting time delay, w/200K Amp AIC
Individual Equipment where fault current does not exceed 50 KA	Class K5 U/L listed, with 50 KA interrupting rating.

The contractor shall provide 10% of each fuse size (size and type) required by the project (with a minimum of one set as spares) to the owner upon completion.

2.05.3 Fusible safety switches with short-circuit withstand ratings of 100K Amp or 200K Amp require Class R or Class J rejection fuse block feature. (Compliance with NEC Article 110-9 and 240-60b.)

2.06 SURGE PROTECTION DEVICE (SPD) <S>

2.06.1 Panel “MDP” shall be protected by a surge suppression device. An SPD unit as shown on the power riser will be required for protection of this panel. Innovative Technology PTX160-3Y101 (160kA) device was used as the basis of design for this project. See below for a list of additional acceptable manufacturers. The device shall have a minimum of a 20-year warranty and coverage must include all anomalies, including lightning. The devices let-through voltage ratings shall include 6” lead length external to the enclosure and the enclosure must be NEMA 4 rated for indoor and outdoor use. The SPD shall be UL labeled with a 200kA Short Circuit Current Rating (SCCR) as a Type 1 device and shall be listed as compliant to UL 1449, 3rd Edition. The SPD shall include visual LED diagnostics with one green LED indicator per phase, and one red service LED. The SPD shall be installed in accordance with the manufacturer’s installation manual using the recommended breaker and wire sizes.

2.06.2 All SPD units must comply with recent editions of:

a. Underwriters Laboratories: UL1449 and UL 1283
b. ANSI/IEEE C62.41.1-2002, C62.41.2-2002, C62.45-2002
c. National Electrical Code: Article 285

UL 1449 Listed Voltage Protection Ratings (VPRs) shall not exceed the following:

System Voltage	L-N	L-G	L-L	N-G	MCOV
208Y/120	700V	700V	1200V	700V	150V

Submittal shall include a copy of the SPD performance parameters listed at www.UL.com under Certifications, searching using Category Code: VZCA, to verify SCCR, VPR and Type 1 compliance. “Manufactured in accordance with” does not demonstrate equivalence to the UL listings and does not meet this specification.

2.06.3 Install the SPD units with the minimum distance from the distribution panel, with the minimum number of turns or bends and with (3) twists induced in the conductors. SPD units must be separate from the panelboard and fed by a circuit breaker from the respective panel.

Acceptable Manufacturers are Innovative Technology, GE, Siemens, Square D, Advanced Protection Technologies and Lea International.

PART 3 - EXECUTION

3.01 ELECTRICAL LOAD BALANCING

3.01.1 The Contractor shall balance electrical loads at each panel so that neutral current flow is reduced to the lowest possible level and all phase conductors (A, B & C) are as equally balanced as possible. Contractor shall relocate circuit breakers or individual

branch circuits as required to accomplish electrical load balance.

3.02 CIRCUIT BREAKER TESTING:

For services 1000 amperes and larger, the following tests should be performed on the service circuit breakers and the distribution circuit breakers. On site testing shall be performed by a qualified factory technician. All readings shall be presented in tabulated format.

a. Phase tripping tolerance (within 20% of U/L requirements).
b. Trip time (per phase) in seconds.
c. Instantaneous trip (amps) per phase.
d. Insulation resistance (in mega ohms) at 100 volts (phase to phase and line to load).

3.03 GROUND SYSTEM TESTING:

Upon completion of installation of the electrical grounding and bonding systems, the ground resistance shall be tested with a ground resistance tester. Where test 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 grounding and bonding system shall then be retested.

END OF SECTION

26 45 00 - GENERATOR MANUAL TRANSFER SWITCH <S> <OM>

1.0 GENERAL

1.01 Scope

Furnish and install manual (non-automatic) transfer switches (MTS) with number of poles, amperage, voltage, and withstand current ratings as shown on the plans. Each non-automatic transfer shall consist of an inherently double throw power transfer switch unit and a microprocessor controller, interconnected to provide complete operation. All transfer switches and control panels shall be the product of the same manufacturer.

1.02 Acceptable Manufacturers

The basis for design is the manual transfer switch ASCO Series 386. Any alternate shall be submitted to the consulting engineer in writing at least 10 days prior to bid. Each alternate bid must list any deviations from this specification
.

Acceptable Manufacturers: ASCO, Caterpillar, and Russell Electric.

1.03 Codes and Standards

The manual (non-automatic) transfer switches and accessories shall conform to the requirements of:

A. UL 1008 - Standard for Automatic Transfer Switches

B. NFPA 70 - National Electrical Code

C. NFPA 110 - Emergency and Standby Power Systems

D. IEEE Standard 446 - IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications

E. NEMA Standard ICS 10-1993 (formerly ICS2-447) - AC Transfer Switch Equipment

F. NEC Article 702

G. International Standards Organization ISO 9001

PART 2 PRODUCTS

2.01 Mechanically Held Transfer Switch

A. The transfer switch unit shall be manually operated and mechanically held. The switch shall be mechanically interlocked to ensure only one of two possible positions, normal or emergency.

B. The switch shall be positively locked and unaffected by momentary outages so that contact pressure is maintained at a constant value and temperature rise at the contacts is minimized for maximum reliability and operating life.

C. All main contacts shall be silver composition. Switches rated 600 amperes and above shall have segmented, blow-on construction for high withstand current capability and be protected by separate arcing contacts.

D. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. A manual operating handle shall be provided for maintenance purposes. The handle shall permit the operator to manually stop the contacts at any point throughout their entire travel to inspect and service the contacts when required.

E. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.

F. Where neutral conductors must be switched, the MTS shall be provided with fully-rated neutral transfer contacts.

G. Where neutral conductors are to be solidly connected, a neutral terminal plate with fully-rated AL-CU pressure connectors shall be provided.

2.02 Enclosure: The MTS shall be furnished in a NEMA type 1 enclosure unless otherwise shown on the plans.

PART 3 OPERATION

3.01 Controller Operation Provisions

A. The MTS shall be arranged so that it can be easily converted to automatic operation in the future.

3.02 Additional Features

A. Auxiliary contacts, rated 10 amps, 250 VAC shall be provided consisting of one contact, closed when the MTS is connected to the normal source and one contact, closed, when the MTS is connected to the emergency source.

B. Indicating lights shall be provided, one to indicate when the MTS is connected to the normal source (green) and one to indicate when the MTS is connected to the emergency source (red). Also provide output signals to drive optional or customer supplied source availability indicating lights.

C. Inphase Monitor - An Inphase monitor shall be inherently built into the controls. The monitor shall control transfer so that motor load inrush currents do not exceed normal starting currents, and shall not require external control of power sources. The inphase monitor shall be specifically designed for and be the product of the MTS manufacturer.

D. Selective Load Disconnect - A double throw contact shall be provided to operate after a time delay, adjustable to 20 seconds prior to transfer and reset 0 to 20 seconds after transfer. This contact can be used to selectively disconnect specific load(s) when the transfer switch is transferred. Output contacts shall be rated 6 amps at 28 VDC or 120 VAC.

E. Source Availability Lights – (Accessory 9C, 9D).

F. Remote Control Provisions – Provisions for customer supplied 3-position selector switch shall be included (Accessory 43M).

G. Auxiliary Contacts – Aux. contacts to indicate switch position (Acc.14A, 14B).

H. Communications Interface - A full duplex RS485 interface to provide remote monitoring and control by ASCO communications products (Accessory 72A).

PART 4 ADDITIONAL REQUIREMENTS

4.01 Withstand and Closing Ratings

A. The MTS shall be rated to close on and withstand the available rms symmetrical short circuit current at the MTS terminals with the type of overcurrent protection shown on the plans. WCR MTS ratings as be as follows when used with specific circuit breakers:

MTS Size	Withstand & Closing Rating MCCB	W/CLF
30 – 200	22,000A	200,000
225 – 400	42,000A	200,000
600 – 1200	65,000A	200,000
1600 – 2000	85,000A	200,000
2600 – 3000	100,000A	200,000

4.02 Tests and Certification

A. The complete MTS shall be factory tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the voltage, frequency and time delay settings are in compliance with the specification requirements.

B. Upon request, the manufacturer shall provide a notarized letter certifying compliance with all of the requirements of this specification including compliance with the above codes and standards, and withstand and closing ratings. The certification shall identify, by serial number(s), the equipment involved. No exceptions to the specifications, other than those stipulated at the time of the submittal, shall be included in the certification.

C. The MTS manufacturer shall be certified to ISO 9001 International Quality Standard and the manufacturer shall have third party certification verifying quality assurance in design/development, production, installation and servicing in accordance with ISO 9001.

4.03 Service Representation

A. The MTS manufacturer shall maintain a national service organization of company-employed personnel located throughout the contiguous United States. The service center's personnel must be factory trained and must be on call 24 hours a day, 365 days a year.

B. The manufacturer shall maintain records of each switch, by serial number, for a minimum of 20 years.

C. For ease of maintenance and parts replacement, the switch nameplate shall include drawing numbers, part numbers for main coil and control.

END OF SECTION

26 50 00 - LIGHTING

PART 1: GENERAL

1.01 SCOPE:

Work of this Section shall include the following items:

Interior fluorescent
Exterior fluorescent
Exterior HID
Occupancy Sensors

1.02 REFERENCED STANDARDS

NFPA 70 - National Electrical Code
NFPA 101 - Life Safety Code

PART 2 - PRODUCTS

2.01 LIGHTING FIXTURES AND LAMPS <S>

2.01.1 Provide fixtures including interior and exterior fixtures as indicated on the plans and described in the Lighting Fixture Schedule. Acceptable manufacturers are Lithonia, Thomas, Hubbell and Cooper.

2.01.2 Fixtures shall be complete with lamps as indicated, ballasts, internal wiring, LED drivers, brackets, fittings, lenses, louvers, guards, reflectors, pole supports and accessories as required, indicated or detailed.

2.01.3 Ballasts for HID fixtures shall be high power factor constant wattage autotransformer type.

2.01.4 Lamps shall be provided as indicated in the schedule. Nomenclature is based on General Electric lamp code numbers. Comparable lamps by Westinghouse, Philips, Norelco, or Sylvania are acceptable.

a. Fluorescent lamps shall comply with the EPA Guidelines for Toxicity Characteristic Leaching Procedure (TLCP).

b. Fluorescent light fixtures shall have programmable start (rapid start) ballasts when occupancy sensors are used for control.

2.01.5 All battery packs supplying emergency lighting fixtures shall be capable of sustained operation for at least 90 minutes without any degradation in performance and without going into deep cell discharge. See additional requirements below:

a. When the fixture is powered by the battery pack, at least one third of the normal light output shall be available for emergency lighting.

b. All emergency lights shall have a lighted push-to-test button clearly visible and accessible.

c. All battery packs shall be NICAD unless noted otherwise on the plans.

2.01.6 EMERGENCY EXIT LIGHTING FIXTURES

a. The Exit light fixtures shall be completely self-contained and be provided with a maintenance-free battery and automatic charger. The fixtures must be third-party listed as emergency lighting equipment and meet or exceed the following standards: National Electrical Code, N.C. Building Code, NC 2012 Energy Conservation Code, NFPA-101 and NEMA Standards.

2.01.6.1 BATTERY

a. The battery shall be a sealed, maintenance-free type with a minimum of 90 minutes operating time. It shall have a life expectancy of 10 years. It shall be a high temperature type with an operating temperature range of 0 to 60 degrees C. The battery shall contain a resealable pressure vent, a sintered (+) positive terminal and (-) negative terminal.

2.01.6.2 CHARGER

a. The charger shall be a current limiting, full wave rectifying, fully automatic solid state type. The charger shall restore the battery to its full charge within 24 hours after a discharge of 90 minutes under full rated load. The unit shall be activated when the voltage drops below 80 percent. If a LEAD battery is used, a low voltage disconnect switch shall be included to disconnect the battery from the load and prevent damage from a deep discharge during extended power outage.

2.01.6.3 ADDITIONAL FEATURES

a. The unit shall have a pilot light to indicate the unit is connected to AC power. The battery shall have high rate charge pilot light, unless it is a self-diagnostic type. A test switch is also required to simulate the loss of power.

2.01.6.4 WARRANTY

a. The entire unit shall be warranted for three years with an additional two more years of pro-rated warranty for the battery. The warranty shall start the date of project final acceptance and be included in contract documents.

2.01.6.5 LED

a. The use of LED lamps is required. The maximum LED failure rate is 25% within a seven (7) year period. If that maximum is exceeded, the manufacturer shall replace the complete unit at no charge to the owner.

2.01.6.6 UNIT TEST

a. Contractor shall perform a test on each unit after permanent installation and charged a minimum of 24 hours. The battery shall be tested for 90 minutes in accordance with NEC 700.12 (F). The battery test shall be done 10 days prior to final inspection by the State Construction Office. Any unit failing the test must be repaired or replaced, and tested again. A copy of the test report shall be sent to the State Construction Office.

2.01.7 EMERGENCY EGRESS FIXTURE

a**.** It shall be completely self-contained (or remote battery backup as shown on plans), provided with a maintenance-free 12 volt battery, automatic charger, two lamps and other features. Fixture must be third-party listed as emergency lighting equipment, and meet or exceed the following standards: NEC, N.C. Building Code, NC 2012 Energy Conservation Code, NFPA-101, and NEMA Standards.

2.01.7.1 ADDITIONAL FEATURES

a. It shall have a pilot light to indicate the unit is connected to A.C power and a test switch to simulate the operation of the unit upon loss of A.C power by energizing the lamps from the battery. This simulation must also exercise the transfer relay. If a fluorescent emergency unit is used, an LED charging indicator light must be easily visible after installation and a remote test switch shall be installed adjacent to the fixture.

2.01.7.2 BATTERY

a. The battery shall be a sealed, maintenance-free type with minimum of 90 minutes operating time. It shall have a life expectancy of 10 years. It shall be a high temperature type with an operating temperature range of O to 60 degrees C. The battery shall contain a resealable pressure vent and a sintered positive (+) terminal and a negative (-) terminal.

2.01.7.3 CHARGER

a. The charger shall be a current limiting, full wave rectifying, fully automatic type. It shall restore the battery to its full charge within 24 hours after a discharge of 90 minutes under full rated load. It shall be activated when the voltage drops below 80 percent. If a LEAD Battery is used, a low voltage disconnect switch shall be included to disconnect the battery from the load and prevent damage from a deep discharge during extended power outage.

2.01.7.4 WARRANTY

a. The entire unit shall be warranted for three years with an additional two more years' pro-rated warranty for the battery. Warranty shall start the date of project final acceptance and shall be included in contract documents.

2.01.7.5 UNIT TEST

a. Contractor shall perform a test on each unit after it is permanently installed and charged for a minimum of 24 hours. Battery shall be tested for 90 minutes in accordance with NEC 700.12 (F). The battery test shall be done 10 days prior to final inspection by the State Construction Office. Any unit which fails the test must be repaired or replaced, and tested again. A copy of the test report shall be sent to the State Construction Office.

2.01.7.6 ELECTRONIC BALLAST

a. Ballast must be "U/L Listed, Class P", with a sound rating of “A”. No PCB ballast are permitted. The ballast size will be a maximum size of that of a magnetic ballast.

b. Light regulation shall be +/- 10% input voltage variation, and a high power factor with a minimum of 90%.

c. Lamp current crest factor shall be equal to, or less than, 1.7.

d. Input current third harmonics shall not exceed ANSI recommendations (32% total harmonic distortion, 27.5% of the third triplets). Ballast shall also meet FCC Rules and Regulations.

e. Minimum of five (5) years warranty is required with each electronic ballast. The ballast manufacturer shall have a minimum of 5 years experience in electronic ballast manufacturing.

f. Flicker shall be 15% or less with any lamp suitable for the ballast.

g. Parallel wiring between the ballast and the fixture is recommended.

h. Ballast case temperature shall not exceed 25 degrees C rise over 40 degrees C ambient.

2.02 OCCUPANCY SENSORS

The layout of occupancy sensors is based on Sensor Switch devices. Detectors shall utilize Dual Technology microphonic (or ultra-sonic) and passive infrared sensing. Other brand systems must provide the same amount of occupancy sensor coverage and performance. All associated equipment (power packs, etc) required for a complete installation shall be included and installed per manufacturer's recommendations. Submittal of occupancy sensor layout prepared by the proposed manufacturer is required. Floor plan AutoCAD drawings will be provided to the proposed manufacturer upon request via electronic mail.

a. Devices shall utilize multi-technology control by combining both microphonics for sound-motion (or ultra-sonic) and passive infrared (PIR) in areas where called for on the plans. The unit shall have adaptive technology that continuously analyzes its environment and self-adapts, eliminating the need for manual sensitivity and timer adjustments during installation as well as over the life of the unit. The unit shall have selectable operating modes, automatic ON/OFF or manual ON/automatic OFF. The unit shall be rated for 120VAC operation.

b. Wall mounted switches shall be single or dual circuit (as required for dual level switching or step dimming) as noted on the drawings. The sensors are various types depending on the area of coverage. There are wall mounted switches, wall mounted sensors and ceiling mounted sensors as shown on the construction drawings. The installation must be so that they operate with single and dual level override light switches shown on the construction drawings.

c. Ceiling mounted sensors shall be 360 degree or 180 degree operation as noted on the drawings.

d. All sensors shall have a five (5) year warranty.

e. All sensors shall be Ivory in color unless noted otherwise.

f. The contractor shall supply and install complete system including all power packs, low voltage wiring, etc, for a fully operational system.

g. Sensor locations shown on the drawings are approximate. The contractor shall refer to the manufacturer's installation instructions prior to installation.

PART 3 - EXECUTION

3.01 LIGHTING FIXTURES

3.01.1 Installation methods for each fixture shall be as indicated or detailed and as recommended by the fixture manufacturer for the application. Supports such as mounting brackets, hangers, clamps, etc., shall be provided in the best practical manner consistent with good workmanship and appearance.

3.01.2 Lay-in fluorescent or LED fixtures shall be supported at the two opposite ends to the steel frame of the building. Supports shall be provided with the same type of wire as used to support the lay-in ceiling track. Attach one end of the wire to one corner of the fixture and the other end to the building structural system. The fixture shall then be screwed with sheet metal screws to the main runners of the grid at all four corners.

3.01.3 In the event of fixture damage during construction and prior to final acceptance of the project, the fixture shall be replaced or repaired to the satisfaction of the Engineer.

3.01.4 The contractor shall note architectural finish schedules and existing conditions and furnish mounting accessories or trim as required to properly mount each fixture type.

3.01.5 Recessed fixtures shall be provided with mounting frames or rings and shall finish flush to the ceiling without light leaks. Fixtures shall be connected by means of flexible metal conduit (maximum of 6'-0" length whips unless approved by SCO) from outlet boxes mounted above or alongside the fixture. Where recessed fixtures are installed in “hard” ceilings, lighting branch circuit wiring shall be installed in conduit (EMT, etc.) from fixture to fixture and to light switches.

3.01.6 Fixtures exposed to outdoor temperatures shall be rated for 0 degree Fahrenheit operation.

END OF SECTION

DIVISION 27 - COMMUNICATIONS

27 00 10 – GENERAL PROVISIONS

GENERAL SCOPE

Work of this Section shall be in accordance with the intent of the Contract Documents and shall include the following principal items:

Telephone/Data Outlets

TELEPHONE/DATA CABLING SYSTEM:

Provide telephone and data outlet boxes with 1” conduit stubbed up above the ceiling to the plenum return. All raceways shall be a minimum of 1” unless a different size is indicated on drawings. The owner will be responsible for installing all cabling, hardware/software and making final terminations.

END OF SECTION

SECTION 310000 EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the Contract Documents apply to the work of this Section.

B. Refer to Section 01 21 00 and the Bid Form for information concerning required allowances and unit prices.

C. Refer to Section 31 10 00 for topsoil stripping and Section 32 92 00 for topsoil placement.

1.2 SUMMARY

A. This Section includes the following:

1. Excavation, filling, backfilling, and grading indicated and necessary for proper completion of the work.
2. Preparing of subgrade for building slabs, walks, and pavements.
3. Drainage/porous fill course for support of building slabs.
4. Excavating and backfilling of trenches.
5. Excavating and backfilling for underground mechanical and electrical utilities and buried mechanical and electrical appurtenances.

1.3 SUBMITTALS

A. NCDOT approved Job Mix for stone.

B. Imported fill (if required): Submit location of borrow pit and a sample of the soil for approval to the Owner's Geotechnical Engineer a minimum of fourteen (14) working days prior to use.

C. Geotextile Fabric

1.4 DEFINITIONS

A. Excavation: Removal of all material (except for rock) encountered to design subgrade elevations indicated for cut areas and to subsoil elevations in fill areas. Excavation also includes subsequent respreading, moisture conditioning, compaction, and grading of satisfactory materials removed.

B. Unauthorized Excavation: Removal of materials beyond the limits indicated in the definition of "Excavation" without specific direction of Architect.

C. Additional Excavation: Removal, disposal and replacement of materials beyond the limits indicated in the definition of "Excavation" at the direction of the Architect. Refer to Part 3 of this Section for requirements of Additional Excavation.

D. Subgrade: The undisturbed earth (in cut) or the compacted soil layer (in fill) immediately below granular subbase, drainage fill, or topsoil materials.

E. Subsoil: The undisturbed earth immediately below the existing topsoil layer.

F. Building Pad: The area extending 10 feet beyond the exterior limits of the building/column footings and down to undisturbed soils at a one horizontal to one vertical slope.

G. Structures: The area extending a minimum of ten (10) feet beyond the edge of foundations, slabs, curbs, underground tanks, piping or other man-made stationary features occurring above or below ground surface.

H. Pavements: The area extending 10 feet beyond the exterior limits of paved areas and down to undisturbed soils at a one horizontal to one vertical slope. The area extending 3 feet beyond the exterior limits of walks and down to undisturbed soils at a one horizontal to one vertical slope

I. Subbase Material: Artificially graded mixture of crushed gravel or crushed stone meeting NCDOT specifications. Material type is indicated on the drawings.

J. Drainage/Porous Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel meeting the requirements of NCDOT No. 57 Stone.

K. Rock: Hard bed rock, boulders or similar material requiring the use of rock drills and/or explosives for removal. The criteria for classification of general excavation as rock is any material which cannot be dislodged by a Caterpillar D-8 Tractor, or equivalent, equipped with a single tooth hydraulically operated power ripper. The criteria for trench rock shall be that a Caterpillar 345 Backhoe, or equivalent, with a proper width bucket cannot remove the material.

1.5 ADDITIONAL WORK

A. Paragraph 4.3.4 of General Conditions refers to certain conditions that may require additional excavation work. This paragraph is further defined herein and, where there are conflicts, is superseded by this section.

B. Claims for concealed, unknown, or unanticipated subsurface conditions are limited to those circumstances where:

1. Additional excavation work is required below the contract limits indicated to provide acceptable bearing for building pad, structures or pavements.

2. Additional excavation work is required to raise, lower, or revise the footings, foundations or other parts of the building to provide acceptable bearing.

3. Additional excavation work below the utility trench design elevations, for utilities outside the limits of the building, as required to provide acceptable bearing for the utility.

4. Rock is encountered between existing grade and design subgrade.

C. The risks of concealed, unknown, or unanticipated subsurface conditions (except for rock) from existing ground surface to the design subgrade elevations in cut areas and to subsoil elevations in fill areas shall be included in the Contract Amount and shall not be considered as grounds for additional costs to the Contract. The risks of concealed, unknown, or unanticipated subsurface conditions below the elevations stated above shall be considered as Additional Excavation.

D. During construction, if concealed, unknown, or unanticipated subsurface conditions are encountered which require that footings, foundations or other parts of the building be raised, lowered or revised to provide acceptable bearing for the building or if, outside the building limits, additional depth of utility trench excavation below the design subgrade or subsoil elevations is required, immediately notify the Architect upon discovery of such condition prior to disturbing the material encountered.

E. Payment for additional Work

1. Additional excavation shall be counted toward the unit price allowances established in the Bid Form. *The Owner reserves the right to negotiate said unit price allowances prior to the Award of Contract.*

2. Lowering of footings shall be paid for at a negotiated amount. The additional excavation involved shall be counted toward the unit price allowance.

3. Rock removal, if required, shall be counted toward the unit price allowances established in the Bid Form. All rock removal required to complete work other than trenching shall be paid for at the unit price for mass rock removal. Rock payment lines are limited to the following:

a) Two feet outside of concrete work for which forms are required, except footings.

b) One foot outside perimeter of footings, two feet below bottom of footings.

c) In pipe trenches, 6 inches below invert elevation of pipe and 2 feet wider than outside diameter of pipe, but not less than 3 feet minimum trench width.

d) Outside dimensions of concrete work where no forms are required.

e) Under slabs on grade, 6 inches below bottom of concrete slab.

4. No payment will be made for unauthorized excavation.

5. The expense of surveying quantities of rock removal and additional excavation shall be included in the unit price allowances.

1.6 EARTHWORK BALANCE ADJUSTMENTS

A. Adjustments of grades may be allowed with prior written approval of the Architect in order to accommodate shortfall or surplus of material that may occur. Should adjustments be allowed, maintenance of designed drainage patterns and required adjustments to drainage structures shall be a Contract responsibility. **No additional payment will be made for these adjustments**.

1.7 QUALITY ASSURANCE

A. Codes and Standards: Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.

B. Environmental Compliance:

1. Comply with the requirements of the latest edition of the North Carolina Erosion and Sediment Control Manual for Erosion Control during earthwork operations.

2. Comply with the permit conditions for all work performed within wetlands.

C. Testing and Inspection Service: Owner will employ and pay for an independent Geotechnical testing and inspection laboratory to perform soil testing and inspection service during earthwork operations. Cooperate with Owner's Geotechnical Engineer as required for testing and inspection of work. These services do not relieve the responsibility for compliance with Contract Document requirements.

1.8 PROJECT CONDITIONS

A. Site Information: Data concerning subsurface materials or conditions, which are based on test borings, have been obtained by the Owner for his use in designing the project. This data is contained in a report titled "REPORT OF SUBSURFACE EXPLORATION AND GEOTECHNICAL ENGINEERING EVALUATION WAGRAM EQUIPMENT BUILDING, Laurinburg, North Carolina" by ECS Carolinas. Dated November 25, 2014. This report is included in this project manual for information only.

1. The accuracy or completeness of the data is not warranted or guaranteed by the Owner or the Architect/Engineer, and in no event shall be considered part of the Contract Documents. The Owner and Architect/Engineer expressly disclaim any responsibility for the data as being representative of the conditions and materials that may be encountered.

B. Bidders and interested parties (prior to receipt of bids) are encouraged to conduct their own soil and subsurface investigations, examinations, tests, and exploratory borings to determine the nature of the soil conditions underlying the project site. Contact the Owner's office to make an appointment to enter the site for the purpose of conducting your own investigation prior to bid.

C. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner of others except when permitted under the following conditions and then only after arranging to provide acceptable temporary utility services.

1. Notify Architect not less than 48 hours in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without receiving Architect's written permission.
3. Existing utilities across or along the line of work are indicated only in an approximate location. Locate all underground lines and structures. Call "NC One Call" at 1-800-632-4949 prior to construction. If utilities are marked that are not shown on the plans, locate utility vertically and horizontally and provide information to architect. Repair and correct any damage to underground lines and structures.

1.9 SAFETY

A. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights.
   1. Operate warning lights as recommended by authorities having jurisdiction and governing regulations and standards.
   2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Work within the road right-of-way shall meet all requirements of the latest edition of the North Carolina Department of Transportation Workplace Protection Manual.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups CL, GC, SC, GW, GP, GM, SM, SW, and SP.

B. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups CH, OL, OH, MH, ML and PT.

C. Backfill and Fill Materials: Satisfactory soil materials free of clay, rock or gravel larger than 4 inches in any dimension (2 inches for material used in trench backfill), debris, waste, frozen materials, vegetation and other deleterious matter.

D. Imported material for structural fill shall comply with ASTM D2487 soil classification groups CL, ML, SC, SM, SP, SW, GC, GM, GP, or GW.

2.2 ACCESSORIES

A. Non-woven Geotextile Fabric (for drainage): Mirafi 140N, US Fabrics 120NW, Amoco 4547, or equivalent.

B. Woven Geotextile Fabric (for reinforcement): AAMCO 2002, US Fabrics 200, Mirafi 500X, or equivalent.

PART 3 – EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Section 31 10 00 "Site Clearing."

C. Protect and maintain erosion and sedimentation controls during earthwork operations.

3.2 DEWATERING

A. Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.

1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrade and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or runoff areas. Do not use utility trench excavations as temporary drainage ditches.

B. Should any springs or running water be encountered in the excavation, notify the Architect and provide discharge by trenches (or other acceptable means) and drain to an appropriate point of disposal. Provide temporary drainage facilities to minimize the flow of rainwater onto adjacent property. Repair any damage to property or to subgrade as a result of construction and/or dewatering (or lack thereof) operations at no additional cost to the Contract. If permanent provision must be made for disposal of water other than as indicated, the Contract price shall be adjusted.

3.3 EXPLOSIVES

A. There shall be no blasting allowed as a part of earthwork operations.

3.4 EXCAVATION

A. Excavation consists of removal, placement and disposal of material encountered when establishing required subgrade or finish grade elevations.

1. Excavation includes removal and disposal of pavements and other obstructions visible on ground surface; underground structures, utilities and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as rock or unauthorized excavation.

B. Rock Excavation: If Rock is encountered the Owner's Geotechnical Engineer will verify that the material qualifies for classification as rock excavation.

1. If rock is encountered in grading, remove to depths as follows:

a) Under surfaced areas, to 6" under the respective subgrade for such areas.

b) Under grass and planted areas - 12" minimum.

c) Under footings – Two feet below bottom of footing, One foot outside of perimeter of footing.

d) Under trenches – 6" below bottom of trench.

2. Contractor shall employ a surveyor licensed in the state of North Carolina to calculate the quantity of material removed as Rock Excavation. The quantity of rock calculated shall not exceed the volume determined by the payment limits. The Owner's Project Representative shall review the quantity calculated within 48 hours of receiving the survey notes.

3.5 EXCAVATION FOR BUILDING PAD AND STRUCTURES

A. Conform to elevations and dimensions indicated within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction and for review.

B. Excavations for footings and foundations: Do not disturb bottoms of excavation. Excavate by hand to elevations required just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.

1. Where rock is encountered, carry excavation to required elevations and backfill with crushed stone prior to installation of footing.

C. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Structures: Conform to elevations and dimensions indicated within a tolerance of plus or minus 0.10 foot plus a sufficient distance to permit placing and removal of concrete formwork, installation of services, other construction and for review. Do not disturb bottom of excavations intended for bearing surface.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Cut surface under pavements to comply with cross-sections, elevations and grades as indicated.

3.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to uniform width, sufficiently wide to provide ample working room and a minimum of 6 to 9 inches of clearance on both sides of pipe or conduit.

B. Excavate trenches to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on undisturbed soil. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

1. Where rock is encountered, carry excavation to required elevations and backfill with NCDOT #57 crushed stone prior to installation of pipe.

2. For pipes or conduit less than 6 inches in nominal size, and for flat-bottomed, multiple-duct conduit units, do not excavate beyond indicated depths. Hand-excavate bottom cut to accurate elevations and support pipe or conduit on undisturbed soil.

3. For pipes and equipment 6 inches or larger in nominal size, shape bottom of trench to fit bottom of pipe for 90 degrees (bottom 1/4 of the circumference). Fill depressions with tamped sand backfill. At each pipe joint, dig bell holes to relieve pipe bell of loads ensure continuous bearing of pipe barrel on bearing surface.

3.8 EXCAVATION STABILITY

A. General: Comply with local codes, ordinances, and requirements of agencies having jurisdiction.

B. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

C. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.

3.9 SUBGRADE INSPECTION

A. Notify Architect when mass, trench and footing excavations have reached required subgrade. The Architect will arrange for an inspection of conditions by the Owner's Geotechnical Engineer. *Alternative procedures for arranging this review may be implemented at the Owner's written option*.

B. If the Owner's Geotechnical Engineer determines that the subgrade bearing conditions are unacceptable, the Architect will authorize additional excavation until suitable bearing conditions are encountered.

C. Proof-roll subgrade below the building slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).

2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).

3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Under supervision of the Owner's Geotechnical Engineer, proofroll subgrade in cut areas below the building pad and pavement(s) with a loaded dump truck or other approved pneumatic tired vehicle. Should any unstable sub-soil be encountered below pavement or structures, break up the top eight inches of ground surface, pulverize, moisture-condition to optimum moisture content, and compact to percentage of maximum density as stated in Percentage of Maximum Density Requirements. Perform this work at no additional cost and/or time to the Contract.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.10 ADDITIONAL EXCAVATION

A. Additional Excavation (Mass): Remove excavated materials and dispose of off-site as directed by the Architect. Replace this excavated material with satisfactory material placed and compacted according to the requirements of the "Placement and Compaction" section.

B. Additional Excavation in Trenches: Remove excavated materials and dispose of off-site as directed by the Architect. Replace this excavated material with stone.

C. Additional Excavation in Footings: Remove excavated materials and dispose of off-site as directed by the Architect. Replace this excavated material with stone extending 12 inches laterally beyond the footing in all directions. The replacement of excavated materials with lean concrete/ flowable fill may be used in lieu of stone at no additional cost to the Contract.

D. The quantity of material removed as Additional Excavation (Mass, Trench or Footing) shall be calculated by a surveyor licensed in the state of North Carolina and employed by the Contractor. The Owner's Project Representative shall review the quantity calculated within 48 hours of receiving the survey notes.

E. Protect the subgrade during construction. During wet conditions, the subgrade soils may become saturated and soften, possibly resulting in damage to the subgrade if disturbed by equipment. Correct subgrade damaged in this manner. **No additional payment will be made to correct subgrade damaged in this manner**.

3.11 UNAUTHORIZED EXCAVATION

A. Correct Unauthorized Excavation as follows:

1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position when acceptable to Architect.

2. Elsewhere, backfill and compact unauthorized excavations as indicated for authorized excavations of same classification unless otherwise directed by Architect.

3.12 STORAGE OF EXCAVATED MATERIALS

A. Temporarily stockpile excavated materials acceptable for use as backfill and fill. Place, grade, and shape stockpiles for proper drainage. Cover to prevent windblown dust.

1. Stockpile excavated materials away from edge of excavations. Do not store within the drip line of trees to remain.

3.13 BACKFILL AND FILL

A. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Acceptance by local authority having jurisdiction of construction below finished grade, including perimeter insulation.
2. Review, approval, and recording of the locations of underground utilities.
3. Removal of concrete formwork.
4. Removal of shoring and bracing (including backfilling of voids with satisfactory materials).
5. Removal of trash and debris from excavation.
6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow or ice.

C. Ground Surface Preparation: Remove vegetation, debris, obstructions, and deleterious materials from ground surface prior to placement of fills.

D. Bench sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material. Plow, scarify, bench or break up sloped surfaces flatter than 1 vertical to 4 horizontal so fill material will bond with existing material.

E. Place soil material in layers to required subgrade elevations, for each area classification listed below, using materials indicated in Part 2 of this Section.

1. Under grassed areas, use satisfactory excavated or borrow material.
2. Under walks, curbs, and pavements, use satisfactory excavated or borrow material.
3. Under building slabs, use satisfactory excavated or borrow materials and drainage/porous fill material as indicated.

3.14 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and that are carried below bottom of such footings or that pass under wall footings. Place concrete to level of bottom of adjacent footing.

D. Provide 4-inch- (102-mm-) thick, concrete-base slab support for piping or conduit less than 30 inches (762 mm) below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches (102 mm) of concrete before backfilling or placing roadway subbase.

E. Place and compact initial backfill of subbase material, free of particles larger than 1 inch (25 mm) in any dimension, to a height of 12 inches (305 mm) over the utility pipe or conduit.

1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

F. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches (305 mm) over the utility pipe or conduit.

G. Backfill voids with satisfactory soil while installing and removing shoring and bracing.

H. Place and compact final backfill of satisfactory soil to final subgrade elevation.

I. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.

J. Indicate that all underground lines outside the building footprint, except lawn irrigation lines, shall be required to have a warning tape installed directly above utilities between 6 inches (152 mm) to 24 inches (610 mm) below finished grade.

K. Do not backfill trenches until any required testing and inspections have been completed and Architect authorizes backfilling. Backfill carefully to avoid damage or displacement of pipe systems.

L. Under piping and conduit and equipment, use crushed stone where required over rock bearing surface and for correction of unauthorized excavation. Shape excavation bottom to fit bottom 90 degrees of cylinder.

M. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.

3.15 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.

2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

B. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations. Maintain the moisture content of the structural fill materials to within 2% of the optimum moisture content until permanently covered.

C. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to required density.

1. Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

2. Work wet materials as directed by the Owner's Geotechnical Engineer. Base bids on working material daily for a maximum of five days of acceptable weather.

3. No additional payment will be made for these operations.

3.16 COMPACTION OF SOIL BACKFILL AND FILLS

A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

C. Control soil and fill compaction, providing minimum percentage of density indicated for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Architect if soil density tests indicate inadequate compaction.

D. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density at a moisture content within 2% of optimum in accordance with ASTM D1557:

1. Under structures, building pad and pavements, compact each layer of backfill or fill material at 98 percent maximum density. This includes ground under future expansion areas.

2. Under grass or unpaved areas, compact each layer of backfill or fill material at 90 percent maximum density.

E. Seal all fill areas at the end of each working day, utilizing a smooth drum roller.

3.17 GRADING

A. General: Rough grading of areas within the Project, including cut and fill sections and adjacent transition areas, shall be reasonably smooth, compacted and free from irregular surface changes. The degree of finish shall be that ordinarily obtainable from either blade-grader or motor patrol except as otherwise indicated. The finished subgrade surface from the grassed areas generally shall be not more than 0.2 feet above or below the final grade or approved cross section, with due allowance for topsoil.

B. The tolerance for areas within 10 feet of building perimeter, walks and all areas to be paved shall not exceed 0.10 feet above or below the established subgrade. Finish all ditches, swales and gutters to drain readily. Unless otherwise indicated, evenly slope the subgrade to provide drainage away from building walls in all directions at a grade not less than ¼ inch per foot. Provide rounding at top and bottom of cut and fill slopes and at other breaks in grade.

C. Protection of Graded Areas: Protect newly graded areas and areas of cut, fill and design/subgrade elevations from the actions of the elements and from deterioration as a result of construction operations and weather conditions (frost, rains, snow, sleet, hail, etc.). Repair any settlement or washing that occurs prior to or after acceptance of the work. Fill to required subgrade levels any areas where settlement occurs. Protect trees to remain, and, at all areas of the Site where construction operations are in progress, provide protection for the safety of occupants of the existing facilities.

D. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.

2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

E. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 1 inch (25 mm).

2. Walks: Plus or minus 1 inch (25 mm).

3. Pavements: Plus or minus 1/2 inch (13 mm).

F. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.

3.18 PAVEMENT SUBBASE COURSE:

A. General: Place subbase material, in layers of indicated thickness, over subgrade surface to support a pavement base course.

B. Grade Control: During construction, maintain lines and grades including crown and cross-slope of subbase course.

C. Shoulders: Place shoulders along edges of subbase course to prevent lateral movement. Construct shoulders of acceptable soil materials, placed in such quantity to compact to thickness of each subbase course layer. Compact and roll at least at 12” width of shoulder simultaneously with compacting and rolling each layer of subbase course.

D. Placing: Place subbase course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placement operations.

E. When a compacted subbase course is 6” thick or less, place material in a single layer. When more than 6” thick, place material in equal layers, except no single layer more than 6” or less than 3” in thickness when compacted.

F. Place subbase and base course on subgrades free of mud, frost, snow, or ice.

G. On prepared subgrade, place subbase and base course under pavements and walks as follows:

1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.

2. Place base course material over subbase course under hot-mix asphalt pavement.

3. Shape subbase and base course to required crown elevations and cross-slope grades.

4. Place subbase and base course 6 inches (152 mm) or less in compacted thickness in a single layer.

5. Place subbase and base course that exceeds 6 inches (152 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (152 mm) thick or less than 3 inches (76 mm) thick.

6. Compact subbase and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698, ASTM D 1557.

H. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches (305 mm) wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 698, ASTM D 1557.

3.19 BUILDING SLAB DRAINAGE COURSE

A. General: Place drainage/porous fill material, over subgrade surface to support concrete building slabs and sidewalks areas indicated.

B. Place drainage course on subgrades free of mud, frost, snow, or ice.

C. Placing: Place drainage/porous fill material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting material during placement operations.

D. When a compacted drainage course is indicated to be 6 inches thick or less, place material in a single layer. When indicated to be more than 6 inches thick, place material in equal layers, except no single layer more than 6 inches or less than 3 inches in thickness when compacted.

3.20 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.

1. If in the opinion of the Architect, based on testing service reports and inspection, subgrade or fills have been placed that are below required density, perform additional compaction and testing until required density is obtained.

B. The Owner will engage, and pay for, the services of a Geotechnical Engineer whose function shall be to afford complete engineering control by testing of the conditions of all footing subgrades, the placement of all structural fills under structures, building pad and pavement areas, and all compaction where required, and to observe the proof rolling of the building pad and pavement areas.

C. The Owner's Geotechnical Engineer will be present as deemed necessary during all phases of the Work requiring filling, compaction operations or testing. The Geotechnical Engineer will provide the Architect with written certification that fill and compaction was completed with accepted materials in accordance with the Documents, and give a professional opinion regarding shrinkage or settlement of fill and safe load bearing capacity of fill.

D. Site Preparation and Proofrolling: The Owner's Geotechnical Engineer will determine if any additional excavation or in-place densification is necessary to prepare a subgrade for fill placement for slab or pavement support.

E. Fill Placement and Compaction: The Owner's Geotechnical Engineer will witness all fill operations and take sufficient in-place density tests to verify that the indicated degree of fill compaction is achieved. The Owner's Geotechnical Engineer will observe and approve borrow materials used and shall determine if their existing moisture contents are suitable/acceptable.

F. Footing Excavation Review: The Owner's Geotechnical Engineer will review the footing excavations for the building foundations. He will verify that the design bearing pressures are available and that no loose or soft areas exist beneath the bearing surfaces of the footing excavations.

G. The Owner's Geotechnical Engineer will submit two (2) copies each of his reports, recommendations and/or opinions to the Architect/Engineer and the Owner. Pertinent information will be provided to the Contractor as required.

3.21 EROSION CONTROL:

A. Provide erosion control methods in accordance with requirements of authorities having jurisdiction, the North Carolina Erosion and Sediment Control Planning and Design Manual, and as indicated in the Contract Documents.

3.22 PROTECTION

A. Repair and reestablish grades in settled, eroded, and rutted areas to indicated tolerances.

B. Reconditioning Compacted Areas: Where subsequent construction operations or adverse weather disturbs completed compacted areas, scarify surface, reshape, and compact to required density prior to further construction.

C. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

D. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

3.23 DISPOSAL OF WASTE MATERIALS

A. Removal from Owner's Property: Remove excess and/or waste materials, including trash and debris, and dispose of it off Owner's property in a legal manner.

B. Dispose of excess material and materials not acceptable for use as backfill or fill legally offsite.

C. Do not remove topsoil from site until it has been demonstrated to the Owner's satisfaction that it is excess.

END OF SECTION

SECTION 311000 – SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the Contract Documents apply to the work of this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Clearing and grubbing.
2. Removal of trees and other vegetation.
3. Topsoil stripping.

1.3 DEFINITIONS

A. Remove: Remove and legally dispose of items indicated. Removal includes digging out and off-site disposing of stumps and roots.

B. Tree Protection Zone: The 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.

C. Topsoil: Friable, clay loam surface soil, found in varying depths.

1.4 MATERIALS OWNERSHIP

A. 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.

1.5 SUBMITTALS

A. Photographs or videotape, sufficiently detailed, of existing conditions of trees, plantings and other improvements adjoining the construction that might be misconstrued as damage caused by the Work.

1.6 PROJECT CONDITIONS

A. Traffic: Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.

B. Protection of Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place.

1. Protect existing improvements on adjoining properties and on Owner's property.
2. Restore existing improvements damaged by clearing operations to their original condition.

C. The conditions existing at the time of inspection for bidding purposes will be maintained by the Owner to the extent practical. However, minor variations may occur due to natural occurrences prior to the start of clearing work.

D. Do not commence site-clearing operations until erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS

2.1 TREE PROTECTION FENCING

A. Tree protection fencing shall conform to standard and specification 3.38-2 (plastic fence) of the North Carolina Erosion and Sediment Control Planning and Design Manual.

PART 3 – EXECUTION

3.1 PROTECTION OF EXISTING TREES AND VEGETATION

A. Install tree protection fencing as indicated. Erect and maintain a temporary fence around the drip line of individual trees or around the perimeter drip line of groups of trees to remain.

1. Do not store construction materials, debris, topsoil or other excavated material within the tree protection zone.
2. Do not permit vehicles or other equipment within the tree protection zone.
3. Maintain tree protection zones free of weeds and trash.

B. Protect existing trees and other vegetation indicated to remain in place, against unnecessary cutting, breaking or skinning of roots, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line.

C. Provide protection for roots over 1-1/2 inch diameter that are cut during construction operations. Coat cut faces with emulsified asphalt, or other acceptable coating, formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.

D. Repair or replace trees and vegetation indicated to remain which are damaged by construction operations, in a manner acceptable to Architect.

3.2 SITE CLEARING

A. General: Remove trees, shrubs, grass and other vegetation as required to permit installation of the Work. Cut minor roots and branches of trees indicated to remain in a clean and careful manner, where such roots and branches obstruct installation of the Work.

B. Clearing and Grubbing: Clear site of trees, shrubs and other vegetation within the clearing limits indicated.

1. Completely remove stumps, roots, and other debris.
2. Use only hand methods for grubbing inside drip line of trees indicated to remain.
3. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated. Place fill material in horizontal layers not exceeding 6 inches loose depth, and thoroughly compact to a density equal to adjacent original ground.

C. Selective Clearing: Clear areas designated as “Selective Clearing” of all ground covers, underbrush and trees less than 6-inches in diameter at breast height. Coordinate extent of material removed with Architect.

1. Remove trees that appear to be dying or weakening for any reason and at any point during construction up to and including Substantial Completion at the Architect’s direction.

3.3 TOPSOIL STRIPPING

A. Remove heavy growths of grass from areas before stripping.

B. Strip topsoil to whatever depths are encountered, but to a minimum of at least 4 inches.

C. Strip topsoil in a manner to prevent intermingling with underlying subsoil or other material.

1. Remove subsoil and nonsoil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.

D. Where existing trees are indicated to remain, leave existing topsoil in place within drip lines to prevent damage to root system.

E. Temporarily stockpile topsoil in storage piles in areas indicated or directed. Construct storage piles to provide free drainage of surface water. Cover storage piles, if required, to prevent wind erosion.

1. Do not stockpile topsoil within tree protection zones.

2. Stockpile surplus topsoil to allow for respreading deeper topsoil.

F. Dispose of unsuitable or excess topsoil in a legal manner off-site.

3.4 DISPOSAL OF WASTE MATERIALS

A. Burning is not allowed.

B. Removal from Owner's Property: Remove waste materials generated by clearing operations from Owner's property and dispose of in a legal manner off-site.

1. Remove waste materials and debris from the site in a manner to prevent spillage. Pavements and the area adjacent to the site shall remain free from mud, dirt and debris at all times.

2. Clean up debris resulting from site clearing operations continuously with the progress of the work.

END OF SEC

TION

SECTION 312500 – EROSION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The provisions of the Contract Documents apply to the work of this Section.

B. The North Carolina Erosion and Sediment Control Planning and Design Manual, latest edition.

C. NCDOT Roadside Environmental Unit Erosion and Sediment Control Field Guide, latest edition.

D. The North Carolina Division of Highways Erosion and Sedimentation Control/ Stormwater Certification Program for Level 1 Inspectors and Installers.

E. The North Carolina Division of Highways Erosion and Sedimentation Control/ Stormwater Certification Program for Level 2 Site Management.

1.2 SUMMARY

A. This Section includes the installation, maintenance and removal of erosion control measures required for prevention of sediment leaving the project site.

1.3 EROSION AND SEDIMENT CONTROL PERMIT

A. Prior to commencement of work, obtain a copy of the approved Erosion and Sediment Control Plan from NCDOT's Divisions of Highways Roadside Environmental Unit the NCDOT's delegated authority from the NCDENR Land Quality Section.

B. Schedule a pre-construction conference on-site with the Architect and NCDOT Roadside Environmental Unit. Hold this meeting prior to the start of any construction activities.

1.4 SUBMITTALS

A. Responsible Land Disturber registration information.

B. Copies of the weekly Erosion Control Measure inspection reports. *These may be submitted at the monthly progress meetings.*

C. Silt Fence

D. Safety Fence

E. NCDOT Erosion and Sediment Control/ Stormwater Certification for Inspectors and Installers, (Level 1).

F. NCDOT Erosion and Sediment Control/ Stormwater Certification for Site Management, (Level 2).

1.5 PAYMENT PROCEDURES FOR EROSION CONTROL MEASURES

A. Establish a line item in the Schedule of Values for Erosion Control Maintenance. This line item shall represent a minimum of thirty percent (30%) of the total value of the erosion control for the project.

B. Erosion control maintenance will be paid on a monthly basis, following the satisfactory installation and maintenance of the erosion control measures.

PART 2 - PRODUCTS

2.1 EROSION CONTROL PRODUCTS:

A. Safety Fence

1. Six foot high chain link fence with six foot high opaque screening fabric, black in color, complying with the requirements of Standard and Specification North Carolina Erosion and Sediment Control Planning and Design Manual.

2. Screening fabric shall have 96 percent opacity and attached with galvanized metal heavy gauge wire clips, black in color. Fabric shall be a closed mesh woven polyethylene cloth, with reinforced band and grommets along top and sides for secure anchoring to chain link panels.

3. Post appropriate warning signs along the Safety Fence.

B. Construction Entrance

1. Heavy-duty stone aggregate and filter fabric construction entrance, complying with the requirements of Standard and Specification 6.06 of the North Carolina Erosion and Sediment Control Planning and Design Manual.

2. Reinforced concrete wash-rack, draining to a sediment trap.

3. The water source for washing operations shall be the responsibility of the Contractor.

C. Silt Fence

1. Synthetic filter fabric, complying with the requirements of Standard and Specification 6.62 of the North Carolina Erosion and Sediment Control Planning and Design Manual.

2. Posts for fences shall be 1.33 lb/linear ft steel with a minimum length of five feet with projections to facilitate fastening the fabric.

D. Temporary Seeding

1. Temporary vegetative cover for disturbed areas to provide erosion control, complying with the requirements of Standard and Specification 6.10 of the North Carolina Erosion and Sediment Control Planning and Design Manual.

E. Permanent Seeding

1. Refer to Section 32 92 00 “Turf and Grasses” for permanent seeding requirements.

PART 3 - EXECUTION

3.1 INSTALLATION OF EROSION CONTROL MEASURES

A. Install all erosion and sediment control measures per the requirements of the North Carolina Erosion and Sediment Control Planning and Design Manual.

B. Protect all points of construction ingress and egress to the site to prevent tracking of mud onto public streets. Provide temporary construction entrances at all points of access to the site.

C. Clear only those areas necessary for installation of the perimeter erosion control measures. The balance of the site shall not be cleared or otherwise disturbed until the perimeter erosion control measures are installed, functional and approved by the NCDOT Roadside Environmental Unit Inspector and/ or the site Engineer.

D. Follow the construction sequence and install erosion control measures as indicated on the Drawings and as directed by the NCDOT Roadside Environmental Unit Inspector and/ or the site Engineer.

E. Install additional measures as necessary to prevent sediment from leaving the project site.

3.2 MAINTENANCE OF EROSION CONTROL MEASURES

A. Maintain all erosion and sediment control measures per the requirements of the North Carolina Erosion and Sediment Control Planning and Design Manual.

B. At a minimum, the following maintenance is required:

1. Safety Fence

a) Review fence regularly for damage. Repair any damage immediately.

b) Secure the fence at the end of each working day. Repair or replace all locking devices as necessary.

2. Construction Entrance

a) Wash and rework stone and/or place additional stone as required to prevent tracking of mud onto the roadways.

b) Clean out the sediment-trapping device for the washrack.

c) Remove all materials spilled, dropped, washed or otherwise tracked onto roadways or into storm sewers immediately. Do not use water trucks to wash the roadways.

3. Silt Fence

a) Inspect immediately following each rainfall and at least daily during prolonged rainfall.

b) Make any required repairs immediately. Give special attention to damage resulting from end-runs and undercutting.

c) Replace fabric that is decomposing or is otherwise ineffective.

d) Clean out accumulated sediment following every storm event. Do not allow sediment to accumulate higher than one-half the height of the barrier.

4. Temporary Seeding

a) Re-seed and mulch areas where cover is inadequate to protect against erosion until adequate cover is obtained.

C. Remove accumulated sediment as required and at appropriate intervals to maintain the effective function of all erosion control measures.

D. Inspect, repair and remove accumulated sediment from erosion control measures following significant (greater than ½") rainfall events.

E. If erosion control measures become clogged, causing the impoundment of water, restore the measures immediately. Ponded water poses a potential drowning hazard and shall be relieved immediately by either pumping (through an approved dewatering structure) or by removal of the blockage.

3.3 REMOVAL OF EROSION CONTROL MEASURES

A. Remove all temporary erosion control measures following the stabilization of the site. Do not remove erosion control measures until authorized by the NCDOT Roadside Environmental Unit Inspector and the site Engineer and/ or the site Engineer.

B. Topsoil, permanently seed and stabilize areas occupied by erosion control measures.

END OF SECTION 31 25 00

SECTION 313116 – TERMITE CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The provisions of the Contract Documents apply to the work of this Section.

1.2 SUMMARY

A. This Section includes soil treatment for termite control.

1.3 SUBMITTALS

A. Product data and application instructions.

B. Certification that products used comply with U.S. Environmental Protection Agency (EPA) regulations for termiticides.

1.4 QUALITY ASSURANCE

A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for preparing substrate and application.

B. Engage a professional pest control operator who is licensed according to regulations of governing authorities to apply soil treatment solution.

C. Use only termiticides that bear a federal registration number of the EPA and are approved by local authorities having jurisdiction.

1.5 JOB CONDITIONS

A. Restrictions: Do not apply soil treatment solution until excavating, filling, and grading operations are completed, except as otherwise required in construction operations.

B. To ensure penetration, do not apply soil treatment to frozen or excessively wet soils or during inclement weather. Comply with handling and application instructions of the soil toxicant manufacturer.

1.6 WARRANTY

A. Warranty: Furnish written warranty, executed by Applicator and Contractor, certifying that applied soil termiticide treatment will prevent infestation of subterranean termites. If subterranean termite activity is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

B. Warranty Period: 5 years from date of Substantial Completion. Also, include a renewable warranty for the Owner’s future consideration.

C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 SOIL TREATMENT SOLUTION:

A. Use an emusible concentrate insecticide for dilution with water, specially formulated to prevent infestation by termites. Fuel oil will not be permitted as a diluent. Provide a working solution of one of the following chemical elements and concentrations:

1. Cypermethrin (Demon TC) 0.5% in water emulsion.

B. Other solutions may be used as recommended by Applicator and if acceptable to local governing authorities. Use only soil treatment solutions that are not injurious to planting.

PART 3 - EXECUTION

3.1 APPLICATION

A. Surface Preparation: Remove foreign matter that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and foundations. Toxicants may be applied before placing compacted fill under slabs if recommended by toxicant manufacturer.

B. Application Rates: Apply soil treatment solution as follows:

1. Under slab-on-grade structures, treat soil before concrete slabs are placed, using the following application rates:

a) Apply 4 gallons of chemical solution per 10 linear feet (5.1 L of chemical solution per meter) to soil in critical areas under slab, including entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footers.

b) Apply 1 gallon of chemical solution per 10 sq. ft. (4.1 L of chemical solution per sq. m) as an overall treatment under slab and attached slab areas where fill is soil or unwashed gravel. Apply 1-1/2 gallon of chemical solution per 10 sq. ft. (6.1 L of chemical solution per sq. m) to areas where fill is washed gravel or other coarse absorbent material.

c) Apply 4 gallons of chemical solution per 10 linear feet (5.1 L of chemical solution per meter) of trench for each 12 inches (305 mm) of depth from grade to footing, along outside edge of building. Dig a trench 6 to 8 inches (152 to 203 mm) wide along outside of foundation to a depth of not less than 12 inches (305 mm). Punch holes to top of footing at not more than 12 inches (305 mm) o.c. and apply chemical solution. Mix chemical solution with the soil as it is being replaced in the trench.

2. At hollow masonry foundations or grade beams, treat voids at rate of 2 gallons per 10 linear feet 2.6 L per meter, poured directly into the hollow spaces.

3. At expansion joints, control joints, and areas where slabs will be penetrated, apply at rate of 4 gallons per 10 linear feet (5.1 L per linear m) of penetration.

C. Post signs in areas of application to warn workers that soil termiticide treatment has been applied. Remove signs after areas are covered by other construction.

D. Reapply soil treatment solution to areas disturbed by subsequent excavation, landscape grading, or other construction activities following application.

E. Allow not less than 12 hours drying time after application before beginningconcrete placement or other construction activities.

END OF SECTION

SECTION 321200 ASPHALT PAVEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the Contract Documents apply to the work of this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Hot-mix asphalt paving over prepared subbase.
2. Hot –mix asphalt patching.

1.3 SUBMITTALS

A. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.

B. Material Certificates: Certificates signed by manufacturers certifying that each material complies with requirements.

C. Traffic maintenance and Work Area Protection Plan: Submit a plan indicating sequencing and measures to be used for the maintenance and protection of traffic during operations within or immediately adjacent to existing roadways open to vehicular traffic. The Architect and the North Carolina Department of Transportation must approve this plan prior to commencement of work within the Right-of-Way.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed hot-mix asphalt paving similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Asphalt paving materials and installation shall conform to the requirements of the latest edition of the North Carolina Department of Transportation's (NCDOT) Standard Specifications for Roads and Structures.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if substrate is wet or excessively damp or if the following conditions are not met:

1. Prime Coat: Minimum ambient temperature away from artificial heat is 40 deg F (4 deg C) or above for plant mix, 50 deg F (10 deg C) or above for surface treatment, and when the temperature has not been below 35 deg F (1 deg C) for 12 hours immediately prior to application. Do not apply prime coats on a frozen surface or when the weather is foggy or rainy.
2. Tack Coats: Minimum ambient temperature away from artificial heat is 35 deg F (1 deg C) or above and when the temperature has not been below 35 deg F (1 deg C) for 12 hours immediately prior to application. Do not apply tack coats on a frozen surface or when the weather is foggy or rainy.
3. Asphalt Base Course: Minimum air and surface temperature of 35 deg F (1 deg C) and rising at time of placement.
4. Asphalt Surface Course: Minimum air and surface temperature of 40 deg F (4 deg C) and rising at time of placement.

1.6 TESTING AND INSPECTION

A. Within the road Right-of-Way, NCDOT inspectors shall observe the asphalt placement. Coordinate the necessary inspection schedule with the local Residency of the NCDOT.

B. The Owner's testing agency will observe the asphalt placement in the parking lots and on-site areas not in Right-of-Way.

PART 2 - PRODUCTS

2.1 ASPHALT-AGGREGATE MIXTURE

A. General: Provide plant-mixed, hot-laid asphalt-aggregate mixture complying with the requirements of the NCDOT Standard Specifications for Roads and Structures and as recommended by local paving authorities to suit project conditions.

2.2 ASPHALT MATERIALS

A. Tack Coat: ASTM D 977, emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.

B. Prime Coat: Asphalt emulsion prime conforming to NCDOT requirements.

2.3 AUXILIARY MATERIALS

A. Paving Geotextile: Nonwoven polypropylene, specifically designed for paving applications, resistant to chemical attack, rot, and mildew.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.

B. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.

C. Notify Architect in writing of any unsatisfactory conditions. Do not begin paving installation until these conditions have been satisfactorily corrected.

3.2 MAINTENANCE AND PROTECTION OF TRAFFIC

A. Utilize flagmen, barricades, warning signs and warning lights as required by the Manual on Uniform Traffic Control Devices (MUTCD).

3.3 PATCHING AND REPAIRS

A. Patching: Saw cut perimeter of patch and excavate existing pavement section to sound base. Recompact new subgrade. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically.

1. Tack coat faces of excavation and allow to cure before paving.

2. Fill excavation with dense-graded, hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.

B. Leveling Course: Install and compact leveling course consisting of dense-graded, hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.

1. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.

C. Crack and Joint Filling: Remove existing filler material from cracks or joints to a depth of 1/4 inch (6 mm). Refill with asphalt joint-filling material to restore watertight condition. Remove excess filler that has accumulated near cracks or joints.

D. Tack Coat: Apply uniformly to existing surfaces of previously constructed asphalt or Portland cement concrete paving and to surfaces abutting or projecting into new, hot-mix asphalt pavement. Apply at a uniform rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m) of surface.

1. Allow tack coat to cure undisturbed before paving.

2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillage and clean affected surfaces.

3.4 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

B. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.

C. Prime Coat: For asphalt sections less than 4” thick, apply uniformly over surface of compacted-aggregate base at a rate of 0.15 to 0.50 gal./sq. yd. (0.7 to 2.3 L/sq. m). Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure for 24 hours minimum.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use just enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.

2. Protect primed substrate from damage until ready to receive paving.

3.5 GEOTEXTILE INSTALLATION

A. Apply bond coat, consisting of asphalt cement, uniformly to existing surfaces at a rate of 0.20 to 0.30 gal./sq. yd. (0.8 to 1.2 L/sq. m).

B. Place paving geotextile promptly according to manufacturer's written instructions. Broom or roll geotextile smooth and free of wrinkles and folds. Overlap longitudinal joints 4 inches (100 mm) and transverse joints 6 inches (150 mm).

1. Protect paving geotextile from traffic and other damage and place overlay paving the same day.

3.6 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt mix on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness, when compacted.

1. Place hot-mix asphalt base course in number of lifts and thickness indicated.

2. Spread mix at minimum temperature of 225 deg F (107 deg C).

B. Place paving in consecutive strips not less than 10 feet (3 m) wide, except where infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete asphalt base course for a section before placing intermediate or surface courses.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.7 JOINTS

A. Construct joints between old and new pavement, or between successive days work, to ensure continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat.
2. Offset longitudinal joints in successive courses a minimum of 6 inches (150 mm).
3. Offset transverse joints in successive courses a minimum of 24 inches (600 mm).
4. Construct transverse joints as required by the NCDOT Standard Specifications for Roads and Structures.
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.

3.8 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).

B. Breakdown Rolling: Accomplish breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Repair surfaces by loosening displaced material, filling with hot-mix asphalt, and rerolling to required elevations.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling, while hot-mix asphalt is still hot enough to achieve indicated density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 95 percent of reference laboratory density according to ASTM D 1559.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm. Surface course average density shall be 95 percent of reference laboratory density.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while still hot, with back of rake or smooth iron. Compact thoroughly using tamper or other satisfactory method. Edges adjacent to curbs and curb and gutter sections shall be flush with the edge of concrete.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials. Remove paving course over area affected and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.9 INSTALLATION TOLERANCES

A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch (13 mm).
2. Surface Course: Plus 1/4 inch (6 mm), no minus.

B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch (6 mm).
2. Surface Course: 3/16 inch (3 mm).
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

C. Check surface areas at intervals as directed by Architect.

3.10 FIELD QUALITY CONTROL

A. Within the NCDOT Right-of-Way, coordinate required inspections with the local Residency of the NCDOT.

B. Testing Agency: Owner will engage a qualified independent testing agency to perform field inspections and tests and to prepare test reports.

1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements.

C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with requirements.

D. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with requirements.

END OF S

ECTION

SECTION 329200 – TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the Contract Documents apply to the work of this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Fine grading and preparing lawn areas
2. Topsoil Placement
3. Soil amendments
4. Fertilizers
5. Seeding
6. Lawn Restoration

1.3 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Lawns: All areas disturbed by construction and not otherwise covered by paving, buildings or other structures.

1.4 SUBMITTALS

A. Certification by product manufacturer that the following products supplied comply with requirements:

1. Grass Seed

a) Certification of grass seed from seed vendor for each grass-seed mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging. Do not except seed containing “prohibited” noxious weed seed.

b) North Carolina Crop Improvement Association Certification label for each bag of seed.

B. Installers qualifications

1. Provide a list, with references, of the past three projects of a similar magnitude.

C. Topsoil Amendment Plan.

1. Provide copy of topsoil testing report.
2. List of amendments proposed for topsoil, including application rates.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer, who has successfully completed lawn establishment projects similar in size and complexity to this project. The installer’s primary business (defined as a minimum of 60% of total billings) shall be establishment of lawns.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

1.7 COORDINATION AND SCHEDULING

A. Planting Season: Sow lawn seed during normal planting seasons for type of lawn work required.

1. Late Winter/ Early Spring Planting Season:
    a) Coastal: Dec. 1- Apr. 15
    b) Piedmont: Jan. 1- May 1
    c) Mountains:
        (1) Above 2500 ft. Feb. 15-May 15
        (2) Below 2500 ft. Feb. 1- May 1
2. Fall Planting Season:
    a) Coastal: Aug. 15- Dec. 30
    b) Piedmont: Aug. 15-Dec. 30
    c) Mountains: Aug. 15- Dec. 15
3. Summer Planting Season:
    a) Coastal: Apr. 15-Aug. 15
    b) Piedmont: May 1- Aug. 15
    c) Mountains: May 15- Aug. 15

B. Weather Limitations: Proceed with planting only when existing and forecast weather conditions are suitable for work.

C. Lawn Seeding Schedule

1. Refer to the drawings for early seeding requirements for specified lawn areas.
2. If job completion schedule does not allow seeding within a normal planting season, provide interim temporary seeding necessary to stabilize site. Complete permanent seeding during the next planting season.

1.8 LIMITS OF SEEDING

A. Spread topsoil and seed all lawn areas.

1.9 LIMITS OF LAWN RENOVATION

A. All existing lawn areas disturbed by construction activities.

1.10 PAYMENT PROCEDURES FOR LAWNS AND GRASSES

A. Establish a line item in the Schedule of Values for Lawn Maintenance. This line item shall represent a minimum of thirty percent (30%) of the total value of the seeding for the project.

B. Lawn maintenance will be paid on a monthly basis, following the satisfactory maintenance of the lawns.

PART 2 – PRODUCTS

2.1 TOPSOIL

A. Topsoil: ASTM D 5268, pH greater than 3.6 before liming, and liming is required if it is less than 6.0, organic material content greater than 1.5% by weight, free of stones 1” or larger in any dimension and other extraneous materials harmful to plant growth, soluble salts less than 500 ppm, with a sodium absorption rate less than 12.

1. Topsoil Source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

    a) Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches (102 mm) deep; do not obtain from agricultural land, bogs or marshes.

B. Have topsoil tested by a certified soil testing laboratory to determine the type and quantity of soil amendments necessary. Add amendments to topsoil as necessary to meet these requirements.

2.2 INORGANIC SOIL AMENDMENTS

A. If the topsoil analysis indicates the need for inorganic soil amendments, the following standards apply:

B. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:

1. Class: Class O, with a minimum 95 percent passing through No. 8 (2.36-mm) sieve and a minimum 55 percent passing through No. 60 (0.25-mm) sieve.

2. Provide lime in form of dolomitic limestone.

C. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum 99 percent passing through No. 6 (3.35-mm) sieve and a maximum 10 percent passing through No. 40 (0.425-mm) sieve.

D. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

E. Aluminum Sulfate: Commercial grade, unadulterated.

F. Perlite: Horticultural perlite, soil amendment grade.

G. Agricultural Gypsum: Finely ground, containing a minimum of 90 percent calcium sulfate.

H. Sand: Clean, washed, natural or manufactured, free of toxic materials.

I. Diatomaceous Earth: Calcined, diatomaceous earth, 90 percent silica, with approximately 140 percent water absorption capacity by weight.

J. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

2.3 ORGANIC SOIL AMENDMENTS

A. If the topsoil analysis indicates the need for organic soil amendments, the following standards apply:

B. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 3/4-inch (19-mm) sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 percent of dry weight.

2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

3. Peat: Finely divided or granular texture, with a pH range of 6 to 7.5, containing partially decomposed moss peat, native peat, or reed-sedge peat and having a water-absorbing capacity of 1100 to 2000 percent.

4. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture, free of chips, stones, sticks, soil, or toxic materials.

5. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.4 HERBICIDES

A. Selective Herbicides: EPA registered and approved, of type recommended by manufacturer for application.

2.5 FERTILIZER

A. Fertilizer needs should be determined by soil testing. Soil testing is provided free of charge by the North Carolina Department of Agriculture soil testing laboratory. When soil testing is not available follow guidelines on the individual specification sheet for the seeding mix chosen.

B. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 20 percent phosphoric acid.

C. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.

D. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in topsoil analysis reports from a qualified soil-testing agency.

2. Minimum Composition: No less than 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.

2.6 SEED

A. Grass Seed: All grass seed must be fresh, clean, and dry.

B. Seed Species are as shown on drawing.

C. All seed shall be Blue Tag certified by the North Carolina Crop Improvement Association. Tags must be attached to each bag delivered on site.

2.7 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

B. Peat Mulch: Finely divided or granular texture, with a pH range of 6 to 7.5, containing partially decomposed moss peat, native peat, or reed-sedge peat and having a water-absorbing capacity of 1100 to 2000 percent.

C. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch (25-mm) sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 percent of dry weight.

D. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic; free of plant-growth or germination inhibitors; with maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.

2.8 EROSION-CONTROL MATERIALS

A. Erosion-Control Fiber Mesh: Biodegradable twisted jute or spun-coir mesh, a minimum of 0.92 lb/sq. yd. (0.5 kg/sq. m), with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive lawns and grass for compliance with requirements and for conditions affecting performance of the Work. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

B. 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.

3.3 TOPSOIL PLACEMENT FOR LAWNS

A. Limit subgrade preparation to areas that will be planted in the immediate future.

B. Loosen subgrade to a minimum depth of 4 inches. Remove stones, sticks and roots larger than 2 inches in any dimension from subgrade. Completely remove trash and other extraneous debris from subgrade.

C. Have topsoil tested by a certified soil testing laboratory to determine the type and quantity of soil amendments necessary.

D. Sift topsoil to remove stones and other objects larger than 1” in any dimension. Maximum object size for topsoil shall be achieved by sifting not by hand removal or raking following placement of topsoil.

E. Mix soil amendments and fertilizers with topsoil at rates required by soil testing. Delay mixing fertilizer if planting does not follow placing of planting soil within 4 days. Either mix soil before spreading or apply soil amendments on surface of spread topsoil and mix thoroughly into top 4 inches (102 mm) of topsoil before planting.

F. Mix lime with dry soil prior to mixing fertilizer.

G. Spread topsoil to a minimum depth of six inches (6”).

3.4 SEEDING LAWNS

A. Sow seed with a spreader or a seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in 2 directions at right angles to each other.

B. Do not use wet seed or seed that is moldy or otherwise damaged in transit or storage.

C. Sow seed at the following rates:

1. Seeding Rate: Base seeding rates on the guidelines of the individual specification sheet for the chosen seeding mix.

D. Rake seed lightly into top 1/4 inch of topsoil, roll lightly, and water with fine spray.

E. Protect seeded areas 3:1 slope/grade or steeper against erosion by providing erosion-control blankets installed and stapled according to manufacturer's recommendations.

F. Protect seeded areas less than 3:1 slope/grade against erosion by spreading straw mulch after completion of seeding operations. Spread uniformly at a minimum rate of 2 tons per acre (45 kg per 100 sq. m) to form a continuous blanket 1-1/2 inches (38 mm) loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.

1. Anchor straw mulch by crimping into topsoil by suitable mechanical equipment.

3.5 LAWN RENOVATION

A. Renovate existing lawn. Limits of existing lawn to be renovated are indicated on the drawings.

B. Renovate existing lawn damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.

1. Reestablish lawn where settlement or washouts occur or where minor regrading is required.

C. Remove sod and vegetation from diseased or unsatisfactory lawn areas; do not bury in soil.

D. Remove topsoil containing foreign materials resulting from Contractor's operations, including oil drippings, fuel spills, stone, gravel, and other construction materials, and replace with new topsoil.

E. Mow, de-thatch, core aerate, and rake existing lawn.

F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.

G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.

H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.

I. Apply soil amendments and initial fertilizers required for establishing new lawns and mix thoroughly into top 4 inches of existing soil. Provide new planting soil to fill low spots and meet finish grades.

J. Apply seed and protect with straw mulch as required for new lawns.

K. Water newly planted areas and keep moist until new lawn is established.

3.6 MAINTENANCE OF NEW LAWNS

A. Begin maintenance of lawns immediately after each area is planted and continue until acceptable lawn is established. Maintain seeded lawns until Substantial Completion. Maintain all grassed areas as necessary to ensure a satisfactory lawn is achieved at Substantial Completion.

B. Maintain and establish lawns by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.

1. Replant bare areas with same materials as for lawns.

2. Replace disturbed mulch.

C. Watering: Provide and maintain temporary hoses, and lawn-watering equipment to convey water from a water source to keep lawns uniformly moist to a depth of 4 inches.

1. Provide a source of water for irrigation. Utilize temporary irrigation meters, a well or water trucks as necessary for the water source.

2. Water seeded areas as necessary to promote vigorous growth of grass but at the minimum rate of 1 inch per week.

3. Water sodded areas per the requirements of the grower. Maintain moist soil to a depth of at least four inches.

D. At a minimum, the following fertilizer applications are required:

1. By November 30, apply 10-10-10 commercial fertilizer at the rate of 800-1000 lbs. per acre, 500 lbs. per acre of 20% superphosphate, and 2000 lbs. per acre of dolomite lime over all seeded and sodded areas.

2. By March 30, apply 10-10-10 commercial fertilizer at the rate of 800-1000 lbs. per acre, 500 lbs. per acre of 20% superphosphate, and 2000 lbs. per acre of dolomite lime over all seeded and sodded areas.

3. Provide written acknowledgement that this requirement has been met prior to requesting Substantial Completion.

E. Mow lawns as soon as there is enough top growth to cut with mower set at indicated height. Repeat mowing as required to maintain indicated height without cutting more than 40 percent of the grass height (minimum of 3 mowings). Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain following grass height:

1. Mow grass to a finished height of 2 to 3 inches high.

F. Apply pre-emergent herbicide to lawns areas. Apply 60 – 90 days after planting.

3.7 SATISFACTORY LAWN

A. Seeded lawns shall be considered satisfactory/acceptable provided requirements, including maintenance, have been met and a healthy, uniform, close stand of grass is established, free of weeds, bare spots exceeding 5 by 5 inches (125 by 125 mm), and surface irregularities.

B. Replant lawns that do not meet requirements and continue maintenance until lawns are satisfactory/acceptable.

C. Substantial Completion of the building and the remainder of the project may be achieved (pending prior Architect and Owner approval) before achieving a satisfactory/acceptable lawn. Continue to replant and maintain unsatisfactory/unacceptable lawn areas until acceptance is obtained. Warranties for lawns shall begin at the time of acceptance of the lawn.

3.8 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by lawn work from sidewalks and paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto surface of roads, walks, or other paved areas.

B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period until lawn is established.

END OF SECTION

SECTION 331000 – EXTERIOR WATER SYSTEM

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the Contract Documents apply to the work of this Section.

B. Reference Specifications are referred to by abbreviation as follows:

1.	American National Standards Institute	ANSI
2.	National Sanitation Foundation	NSF
3.	American Society for Testing and Materials	ASTM
4.	American Water Works Association	AWWA
5.	National Bureau of Standards	NBS
6.	North Carolina Department of Transportation	NCDOT
7.	North Carolina Department of Health and Human Services	NCDH

1.2 SUMMARY

A. This section includes water service piping, fire protection service mains and appurtenances from the source of water to a point 5 feet outside the building.

1.3 SUBMITTALS

A. Submit shop drawings and/or product data for the following:

1. Pipe
2. Fittings
3. Valves
4. Valve Boxes
5. Detectable Marking Tape
6. Tracing Wire
7. Tapping Sleeve and Valves
8. Corporation Stop
9. Bedding Stone (NCDOT approved job-mix formula)

B. Certification provided by the contractor that all water systems and appurtenances have been tested and meet the provisions of the contract documents.

1.4 QUALITY ASSURANCE

A. Environmental Compliance: Comply with applicable portions of local environmental agency regulations pertaining to water systems, and to the requirements of the latest edition of the North Carolina Erosion and Sediment Control Planning and Design Manual for erosion control during installation.

B. Regulatory Requirements:

1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Prepare materials for shipping and transport as follows:

1. Ensure materials are dry and internally protected against rust and corrosion.
2. Protect materials against damage to threaded ends, flange faces, pipe belts and spigots, and coatings.
3. Set materials in best position for handling to prevent rattling.

B. Storage: Use the following precautions for materials during storage:

1. Do not remove end protectors unless necessary for inspection, and reinstall for storage.
2. Protect materials from weather, moisture and dirt. If outdoor storage is necessary, elevate and support materials off the ground or pavement in watertight enclosures.
3. Store pipe in accordance with manufacturer's recommendations. Do not store plastic structures, pipe, and fittings in direct sunlight. Support materials to prevent sagging and bending.

C. Handling: Handle materials on-site to prevent damage.

1. Handle materials to prevent interior and exterior coating and pipe-end damage, and to prevent the entrance of dirt, debris, and moisture.
2. Handle pre-cast concrete manholes and other structures according to manufacturer's written rigging instructions.
3. If any portion of piping and fittings is damaged, repairs should be made in accordance with manufacturer's recommendations prior to installation.

1.6 PROJECT CONDITIONS.

A. Site Information: Perform site survey to verify existing utility locations. Verify that water distribution system piping may be installed in compliance with the design and referenced standards.

B. Locate existing structures and piping to be closed and abandoned.

C. Existing Utilities: The location of existing utilities, including underground utilities, are indicated on the drawings so far as their existence and location were known at the time of preparation of the drawings. However, nothing in these Contract Documents shall be construed as a guarantee that such utilities are in the location indicated or that they actually exist, or that other utilities are not within the area of operations. The Contractor shall make all necessary investigations to determine the existence and locations of such utilities far enough in advance of pipe laying to allow for adjustments due to conflicts in the horizontal and vertical positions of the pipeline.

1. Do not proceed with utility interruptions without receiving Architect's written permission.
2. Notify Architect not less than 48 hours in advance of proposed utility interruptions.
3. Do not interrupt existing utilities serving facilities occupied by others except when permitted by the utility owner and after arranging to provide acceptable temporary utility services.
4. Existing utilities across or along the line of work are indicated only in an approximate location. Locate all underground lines and structures. Call "NC One Call" at 1-800-632-4949 prior to construction. If utilities are marked that are not shown on the plans, locate utility vertically and horizontally and provide information to architect. The contractor shall pay for any damage to and for maintenance and protection of existing utilities and structures.

D. Connections to Existing System:

1. Before the start of the construction, the Contractor shall dig test pits on all crossings of and connections to the existing system, as applicable, to determine the existing system location, size, and piping material. If the location, size, and piping material differs from that shown on the Drawings, notify Engineer immediately.
2. The Contractor shall make connections to the existing system under a pressure or non-pressure condition, as indicated, complying with the system owner's requirements for the time of day such work can be done. The Contractor shall pay all costs associated with the connections unless otherwise indicated. If the system owner performs the work, the Contractor shall arrange for the work to be done.
3. Valves are to be operated only by the Owner.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate with interior building water piping.

B. Coordinate with other utility work.

C. Utility interruptions shall be coordinated with local utility provider. Written notice 72 hours in advance of utility interruption shall be provided to all affected customers.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide pipe materials and fittings compatible with each other.

2.2 PIPE

A. Copper Tubing

1. For below ground service 2" and smaller use Type "K" soft copper pipe and tubing conforming to the requirements of ASTM B88.

2.3 FITTINGS

A. Copper

1. Fittings for copper piping shall be flared or compression type meeting requirements of ANSI C800 and local plumbing codes to connect pipe and tube.

2.4 VALVES

A. Gate Valves

1. Sizes 12 inches and smaller

a) Gate valves 12" and smaller shall be resilient wedge, rising stem, O-ring sealing, 250 psi operating pressure, 2-inch square AWWA operating nut, comply with AWWA C-509, latest revision, and be UL listed, FM Approved, as well as certified by NSF to Standard 61. Ductile iron valves shall meet the requirements of AWWA C515 with a working pressure of 250 psi.

b) All buried valves shall be manually operated non-rising stem, equipped with a 2-inch square AWWA operating nut, for installation in a vertical position, unless otherwise specified. All valves for underground vaults and above-ground service shall be manually operated outside stem and yoke (OS&Y).

c) Valve ends shall be mechanical joint for buried underground service and flanged for underground vaults and above-ground service.

d) The interior and exterior of the body and bonnet shall be coated with a minimum of 8 mils of fusion bonded epoxy per AWWA C550 Standard for Protective Interior Coatings for Valves and Hydrants.

e) All internal parts shall be accessible without removing the body form the line.

f) All valves shall open left (counter-clockwise) with mechanical joint ends.

g) Valves shall be rated for 250 psi operating pressure and 500 psi test pressure.

h) Valve stem extensions shall be required where the valve-operating nut is installed at a depth greater then four feet (4').

i) Resilient wedge gate valves shall be warranted to the owner for 10 years from the date of purchase against defective material or workmanship.

2.5 VALVE BOXES

A. Valve boxes shall comply with AWWA M44 for cast-iron valve boxes. Materials shall include top section, adjustable extension (of length required for depth of burial of valve), cover (with lettering "WATER" cast or embossed on the cover), bottom section with base of size to fit over valve, and approximately 5-inch diameter barrel. All box assemblies shall have screw adjustment

B. Valve boxes shall be firmly supported, centered and plumb over the operating unit of the valve. Box cover shall be set flush with the surface of finished pavement or at such other level as may be directed by the Architect. Valve rod extension with guide shall be required to maintain a distance of 2' – 4' from operating nut to top of box. The extension shall be provided with a 2-inch square operating not on top and a coupling to connect the extension to the operating nut on the valve. All valves shall be properly restrained.

C. Extension pieces, if required, shall be cast iron or ductile iron. PVC pipe is not allowed for extensions.

2.6 THRUST RESTRAINT

A. Proved thrust restrain consisting of concrete blocking, bell restraint harness, retainer gland type or restrained joint type pipe at all changes in direction of pressure pipelines and as shown on construction drawings.

B. Concrete thrust blocking units shall be as shown on the construction drawings or as directed by the inspector based upon field conditions. Concrete thrust blocking shall bear against undisturbed earth, and concrete shall have 3,000 psi strength at 28 days, and shall meet requirements of ASTM C94.

C. Where Lug Type retainer glands are used, installation must conform to the recommendations of the manufacturer before the pipe is backfilled and tested.

2.7 DETECTABLE MARKING TAPE

A. Detectable marking tape shall be installed above all waterline pipe (including all service laterals).

B. Plastic marking tape shall consist of one layer of aluminum foil laminated between two layers of inert plastic film. Tape shall be resistant to alkalis, acids and other destructive agents commonly found in the soil. The laminate shall be strong enough that the layers cannot be separated by hand.

C. Tape shall be a minimum of 4-1/2 mils thick with a minimum tensile strength of 60 lbs. in the machine direction and 58 lbs. in the transverse direction per 3" wide strip. Tape color shall be APWA Color Coded for marking the particular utility line and shall be imprinted with a continuous warning message to indicate the type of utility being marked, the message normally being repeated every 16" to 36". Tape shall be inductively locatable and conductively traceable using a standard pipe and cable-locating device. Tape shall be 3" wide Terra Tape "Sentry Line Detectable 620," or approved equivalent.

2.8 TRACING WIRE

A. Tracing Wire shall be installed on all non-metallic waterline (including all service laterals).

B. Wire shall be No. 12, stranded, type THHN, thermoplastic insulated and nylon jacketed. Wire shall be color coded blue for water.

C. Acceptable Wire Connectors:

1. Set screw pressure type for use with No. 12 stranded wire size. Holub Industries MA-2, Ideal Industries Model 30-222, or approved equal.

2. C-Tap for two way splicing of tracer wire, for use with No. 12 stranded wire size. T&B #54705 or approved equal.

3. Split bolts, three wire type for splicing of tracer wire, for use with No. 12 stranded wire size ILSCO Catalog #SEL-2S or approved equal.

D. Electric Tape – Vinyl electric tape.

E. Electrical Coating - Scotchkote 3M electrical coating Part No. 054007 or approved equal. .

F. Wire nut – non-conductive for No. 12 stranded wire size.

2.9 CORPORATION STOP

A. The corporation stop will have tapered inlet threads in accordance with AWWA C800, latest edition. The corporation stop shall be made of a bronze alloy. It shall be similar to the Mueller compression connection type of or the Ford pack joint type.

B. PART 3 – EXECUTION

3.1 INSTALLATION OF NEW WATER SYSTEMS

A. Excavating and Backfilling

1. Contractor shall do all

2. Excavating of any and all materials encountered in the course of excavating for all underground utility systems. After the pipe is in place, backfill with suitable earth, free from rocks, organic material, etc.

   a) Provide all necessary shoring required for the protection of excavations, existing utilities and workmen and do all necessary pumping required to keep excavation and pipe free of water from any source at all times.

   b) Provide sufficient barricades, etc., adjacent to excavations to safeguard against injury to workmen and the public. Provide and maintain sufficient warning lanterns at walks, roadways, and parking areas to provide safety at all times.

   c) Where roots of live trees are encountered in excavations, they shall be carefully protected during construction.

   d) Exercise special care in backfilling trenches to guard against disturbing the joint.

   e) Remove and dispose of any material not used for backfill.

3. Removal of subsurface obstructions which are uncovered during excavation for installation of the water systems shall be removed by the Contractor at his expense. This shall include removal of existing concrete or brick of existing building foundations, footings, abandoned utility piping, wires, structures, rock boulders, etc., which may not be visible from surface investigations before construction, but will interfere with new installations. If such obstructions are encountered, they shall be removed two feet from around the area of new facility and backfilled with a suitable material as specified.

B. Pipe Installation

1. Take precautions to ensure that pipe and related items are not damaged in unloading, handling and placing in trench. Examine each piece of material just prior to installation to determine that no damage has occurred. Remove any damaged material from the site and replace with undamaged materials.

2. Keep pipe clean. Exercise care to keep foreign material and dirt from entering pipe during storage, handling and placing in trench. Plug or cap line at the end of each day.

3. Do not lay pipe when weather or trench conditions are unsuitable.

4. Line and grade hubs shall be set by a registered surveyor at intervals to accurately insure proper location of water line and appurtenances. This shall include finished grade centerline stakes for fire hydrants, stakes at all fittings, referencing all property pins, etc. Cut sheets are required where the water line is to be laid to a grade according to the profiles in the plans, or where the future road grade is not yet to within 6” of its final location.

5. Water Pipe Laying

a) Laying of water pipe shall be accomplished only after the trench has been dewatered and the foundation and/or bedding has been prepared. Mud, silt, gravel, and other foreign material shall be kept out of the pipe and off the jointing surfaces.

b) All pipe laid shall be retained in position so as to maintain alignment and joint closure until sufficient backfill has been completed to adequately hold the pipe in place. All pipe shall be laid to conform to the prescribed line and grade shown on the plans and shall include digging out for bell ends.

c) Water pipe runs intended to be laid straight shall be so laid. Deflection from a straight line may be made by deflecting the joints only when permission has been given by the Architect or Inspector. Joint deflection in pipe shall not exceed one-half that recommended by AWWA Standards or the manufacturer, whichever is less. Changes in grade or alignment which cannot be made by deflecting pipe joints shall be made by use of proper bends, offsets or special fittings as required.

d) The water pipe, unless otherwise approved by the Architect or Inspector, shall be laid upgrade from point of connection of the existing water line or form a designated starting point. Water pipe shall be installed with the bell end forward or upgrade. When pipe laying is not in progress, the forward end of the pipe shall be kept tightly closed with a water tight plug or cap. Plywood or plastic is not acceptable as a plug or cap.

e) The pipe shall be fitted and matched so that when liad in the work, units wil form a smooth, uniform invert.

f) Prior to joining the pipe, all surfaces of the pipe to be joined and the surfaces of factory made jointing materials shall be clean and dry. Lubricants, primers, adhesives, etc., shall be applied and the pipes joined as recommended by the manufacturer's specifications. Sufficient pressure shall be applied in making the joint to assure that the pipe is "home". The interior of the pipe shall be cleaned all foreign material as the work progresses. At the end of the work day, the last pipe laid shall be blocked to prevent creep, and closed with a water tight plug or cap.

g) Joining pipe

C. Installation of Services

1. ¾", 1", 1 ½ " and 2" Services

a) All taps shall be made with service saddles.

b) Taps shall be made on a 45° angle.

c) Corporation stops shall be "cc" thread inlet and copper flare outlet for the copper service.

d) Tap shall be made with a tapping machine equipped with a bit designed for the type of pipe being tapped.

e) Distance between taps or from a joint or bell shall be a minimum of 18".

f) Service pipe shall be type "K" soft copper.

g) Services shall be installed with 42" minimum cover up to meter yoke where yoke shall be installed so that meter will set 12"-18" below finished grade.

h) Meter yokes shall be installed with a tail piece of type "K" soft copper 36" long.

i) Meter yoke and box shall be set as shown on the construction drawings, or as directed by the Architect or Inspector. Meters shall be installed on reasonably level ground or conform to the angle of the slope.

j) Backfill shall be hand tamped up to service pipe at tap to prevent corporation stop from being broken off during backfilling.

k) Traffic box to be of cast iron in driveways.

PART 4 – TESTING

4.1 TESTING TECHNIQUES FOR WATER DISTRIBUTION SYSTEM

A. Each properly isolated section of the piping system, including all water services, shall be subjected to a pressure test of 150 psi, or 1 ½ times the working pressure whichever is greater, measured at the high point of the system. Maintain this pressure for a minimum of two hours with an allowable leakage as follows:

WATER LINE TEST BASED ON 150 PSI		WATER LINE TEST BASED ON 150 PSI	
SIZE	MAX. ALLOWABLE LEAKAGE	SIZE	MAX. ALLOWABLE LEAKAGE
3/4"	.0138 (GAL/2 HRS)/100 L.F.	6”	.1103 (GAL/2 HRS)/100 L.F.
1”	.0184 (GAL/2 HRS)/100 L.F.	8”	.1471 (GAL/2 HRS)/100 L.F.
1 ½”	.0276 (GAL/2 HRS)/100 L.F.	12”	.2207 (GAL/2 HRS)/100 L.F.
2”	.0368 (GAL/2 HRS)/100 L.F.	16”	.2942 (GAL/2 HRS)/100 L.F.
3”	.0552 (GAL/2 HRS)/100 L.F.	20”	.3678 (GAL/2 HRS)/100 L.F.
4”	.0736 (GAL/2 HRS)/100 L.F.	24”	.4413 (GAL/2 HRS)/100 L.F.

Prior to applying pressure to the lines, all reaction blocking, and/or mechanical restraints shall have been completed to the satisfaction of the Architect or Inspector. As the pipes are being filled, all air shall be expelled from the pipes by providing manual air relief valves at the high points of the system.

B. Any defects discovered during this test shall be repaired and the test repeated until the results are satisfactory to the Architect or Inspector. Provide all equipment, materials and labor necessary to conduct the test. Provide a suitable test pump and properly calibrated gauge or other means for measuring leakage (such as a clean 50-gallong barrel with top cut out) which is satisfactory to the Architect or Inspector.

C. Water used for flushing, sterilization and testing shall be furnished by the Contractor at his expense. Filling of water line may be performed after permission has been obtained from authority responsible for coordinating this activity. Contractor is not permitted to operate valves on existing lines.

4.2 DISINFECTION

A. Prior to being placed in service, the pipe line and appurtenances shall be disinfected in general accordance with ANSI/AWWA C651, latest edition, “AWWA Standard for **Disinfecting Water Mains**”. Supplemental procedures stipulated in the following sections compliment the AWWA C651 Standard, particularly with respect to flushing, testing, and tie-in to the existing water distribution system.

1. Prevent contaminating materials from entering the water main during storage, construction, or repair.
2. Remove, by flushing or other means, those materials that may have entered the water main. .
3. Chlorinate any residual contamination that may remain, and flush the chlorinated water from the main.
4. Protect the existing distribution system from backflow due to hydrostatic pressure test and disinfection procedures.
5. Determine the bacteriological quality by laboratory test after disinfection.
6. Make final connection of the approved new water main to the active distribution system.

B. Filling and Testing Procedures

1. Connection for the new water main to the existing distribution system for filling and testing shall be through a Contractor furnished flushing mechanism. The Contractor is to furnish the single gate valve, double check valve flushing assembly and all necessary fittings, reducers, increases and sleeves to make the piping connections. Assembly shall be approved by the responsible water authority prior to its use. A suitable valved piping arrangement for the addition of the water-chlorine solution is to be available on the new line side of the flushing assembly. The assembly is to be furnished with 125 psi rated flange connections and installed in a manner approved by the Architect or Inspector.
2. Initial Flushing
   a) The main shall be flushed prior to disinfection at a velocity of not less than 2.5 ft/s unless the responsible water authority determines that conditions will not permit the required flow. Adequate provision shall be made by the Contractor for disposals and neutralization of flushing water so that no physical or environmental damage results. Backflow prevention and initial flushing shall be in accordance with the following table.

Main Size (Nominal)	Double Check Valve Single Gate Size	INITIAL FLUSH Min. Flow (gpm)
6”	4”	220
8”	4”	400
12”	6”	900
16”	6”	1500
20”	8”	2450
24”	10”	3525

   b) Since the large volume of water may have effects on the existing distribution system, the initial flushing is to be done only when the approval of and under the direction of the Architect or Inspector. System demands may cause this flushing to be done at times when the existing distribution system demands are low.
   c) Because of the large volume of water to be flushed from the fire hydrants or flushing hydrants, the Contractor must inspect the areas of discharge and provide the necessary equipment or materials to prevent any environmental damage or erosion. Sufficient hose length and termination fitting are to be provided so as to discharge the water into stable, heavily vegetated areas, drainage ponds, storm sewers, paved ditches, etc. The Contractor is to be responsible for any damage that may result from flushing.

3. Forms of Chlorine for Disinfection

   It is the Contractor's responsibility to be familiar with and have available for his employees the "Product Data Safety Sheets" of any products used as a source of chlorine and to provide the proper safety instructions and personal protective equipment to the employees mixing and using materials for disinfection of the water facilities.

   a) Acceptable sources of chlorine for disinfection may be obtained from any of the following three sources:

      i. Liquid sodium hypochlorite (household bleach).

      ii. Liquid sodium hypochlorite (industrial strength).

      iii. Calcium hypochlorite granues.

      Sources of chlorine shall be in conformance with AWWA B300 Standard for Hypochlorites, and NSF 60 and 61.

   b) The direct introduction of chlorine liquid from a pressure cylinder into a waterline is not safe and shall not be allowed.

   c) The mixing of a source of chlorine to obtain a suitable disinfection solution shall be as follows:

      i. Liquid sodium hypochlorite is supplied in strengths from 5.25 percent available chlorine (commercially available household bleach) to 15 percent available chlorine (industrial strength sodium hypochlorite). A water-sodium hypochlorite solution shall be prepared by adding liquid sodium hypochlorite to water.

      ii. A water calcium hypochlorite solution shall be prepared by dissolving calcium hypochlorite granules containing 65% available chlorine by weight in a pre-determined volume of water to make the desired water-calcium hypochlorite concentration. Disinfection of new mains by water calcium hypochlorite solution shall not be used unless a suction or in-line strainer is available on the solution pump to prevent any undissolved solids from entering the piping. An alternative method of straining the solution to remove undissolved granules may be approved by the Architect or Inspector on a case-by-case basis.

4. Method of Chlorine Application and Testing

   a) The continuous feed method of applying the disinfecting solution shall be as follows: Water from the existing distribution system or other approved sources of potable water supply shall flow through a flushing mechanism as indicated on the contract drawings at a constant, measured rate into the newly-laid pipeline. The water shall be mixed with a chlorine-water solution as prepared above, also fed at a constant, measured rate. The two rates shall be proportioned so that the chlorine concentration of the water and water/chlorine solution in the pipe is elevated to and maintained at, a minimum of 50mg/l available chlorine.

   b) Since the forms of preparation for a water-sodium hypochlorite or water-calcium hypochlorite concentration are a batch process, a method acceptable to the Architect or Inspector shall be available to replenish the concentration being fed and mixed with the water flow, so there is no interruption of the flow of disinfection solution.

   c) To assure that this concentration is maintained, the chlorine residual shall be measured at intervals not exceeding 2,000 feet and at the end of all branch lines or cul-de-sacs in accordance with procedures outline herein. During the application of the chlorine-water solution, valves, hydrants and any other appurtenances shall be operated in order to be thoroughly disinfected. Chlorine-water solution application shall continue until the entire new main is filled with water having a residual of a minimum of 50 mg/l chlorine solution.

The chlorinated water shall be retained in the main for at least 24 hours. The free chlorine residual must be at least 10 mg/l after 24 hours in accordance with AWWA C651.

d) After the applicable retention period, the heavily chlorinated water shall be flushed from the main until the chlorine residual of the water leaving the main is equal to the chlorine residual of the incoming system water. At that time, the new system shall be valved off to allow the residual to dissipate to 0.2 mg/l before taking samples for bacteriological analysis.

5. Flushing

a) Flush to remove disinfecting solution. This is a low velocity, low flow, flush through fire or flushing hydrants to remove the disinfecting solution from the new line. The use of a neutralizing chemical and piping arrangement is required. The expense of a neutralizing station is the responsibility of the Contractor.

b) The final flush is a medium velocity, medium flow flush to clear the line of any chlorine solution used in the tie-in and to provide for fresh water throughout the new lines. Final flushing shall be in accordance with the following table.

Main Size (Nominal)	FINAL FLUSH Max. Flow (gpm)
6”	88
8”	160
12”	350
16”	624
20”	978
24”	1410

6. Bacteriological Tests

a) Bacteriological samples will be taken in accordance with AWWA C651, Section 7.

b) After final flushing, and before the water main is placed in service, samples shall be collected and tested for bacteriological quality. Two consecutive negative tests from the same location shall show the absence of coliform organisms. At least two samples shall be collected by the responsible water authority at least 24 hours apart at intervals determined by the Architect or Inspector (not exceed 2,000 feet apart and at the end of all branch lines) and tested by a qualified laboratory selected by the responsible water authority. The responsible water authority shall bill the Contractor a standard fee for this service including all retests.

c) Samples for bacteriological analysis shall be collected in approved sterile bottles or bags treaded with sodium thiosulfate. If laboratory results indicate the presence of coliform bacteria, the samples are unsatisfactory and disinfection shall be repeated as prescribed above until the samples are satisfactory. Cleaning, disinfection and testing shall be under the direction of the Architect or Inspector but remains the responsibility of the Contractor. The Contractor shall be responsible for any cost associated with the loading, hauling, discharging and dechlorination of the heavily chlorinated water.

d) A sampling tap consisting of a corporation cock with metal pipe shall be installed within two feet of valves. The corporation stop inlet shall be male one inch in size and the outlet shall have one inch I.P. threads and a cap.

e) After receiving satisfactory bacteriological test results, the Contractor shall coordinate with the Inspector the connecting of the new main to the existing system. All connecting pipe

and fittings shall be clean and free of debris and shall be swabbed or sprayed with a 1 percent sodium hypochlorite solution before they are installed.

END OF SECTION

SECTION 333000 – SANITARY SEWERAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the Contract Documents apply to the work of this Section.

B. Reference Specifications are referred to by abbreviation as follows:

1.	American National Standards Institute	ANSI
2.	American Society for Testing and Materials	ASTM
3.	American Water Works Association	AWWA
4.	National Bureau of Standards	NBS
5.	North Carolina Department of Transportation	NCDOT
6.	North Carolina Division of Environmental Health	NCEH

1.2 SUMMARY

A. This Section includes sanitary sewerage system piping and appurtenances from a point 5 feet outside the building to the point of disposal or to the connection point into the existing municipal wastewater system.

1.3 SUBMITTALS

A. Submit shop drawings and/or product data for the following:

1. Pipe and pipe lining
2. Fittings
3. Special Pipe Couplings
4. Detectable Marking Tape
5. Cleanouts
6. Bedding Stone (NCDOT approved job-mix formula)

B. Certification provided by the contractor that all materials and sewage piping have been tested and meet the provisions of the contract documents.

1.4 QUALITY ASSURANCE

A. Environmental Compliance: Comply with applicable portions of local environmental agency regulations pertaining to sanitary sewerage systems, and to the requirements of the latest edition of the North Carolina Erosion and Sediment Control Planning and Design Manual for erosion control during installation.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Prepare materials for shipping and transport as follows:

1. Ensure materials are dry and internally protected against rust and corrosion.
2. Protect materials against damage to threaded ends, flange faces, pipe belts and spigots, and coatings.
3. Set materials in best position for handling to prevent rattling.

B. Storage: Use the following precautions for materials during storage:

1. Do not remove end protectors unless necessary for inspection, and reinstall for storage.
2. Protect materials from weather, moisture and dirt. If outdoor storage is necessary, elevate and support materials off the ground or pavement in watertight enclosures.
3. Store pipe in accordance with manufacturer's recommendations. Do not store plastic structures, pipe, and fittings in direct sunlight. Support materials to prevent sagging and bending.

C. Handling: Handle materials on-site to prevent damage.

1. Handle materials to prevent interior and exterior coating and pipe-end damage, and to prevent the entrance of dirt, debris, and moisture.
2. Handle pre-cast concrete manholes and other structures according to manufacturer's written rigging instructions.
3. If any portion of piping and fittings is damaged, repairs should be made in accordance with manufacturer's recommendations prior to installation.

1.6 PROJECT CONDITIONS

A. Site Information: Perform site survey to verify existing utility locations. Verify that sanitary sewerage system piping may be installed in compliance with the design and referenced standards.

B. Locate existing structures and piping to be closed and abandoned.

C. Existing Utilities: The location of existing utilities, including underground utilities, is indicated on the drawings insofar as their existence and location were known at the time of preparation of the drawings. However, nothing in these Contract Documents shall be construed as a guarantee that such utilities are in the location indicated or that they actually exist, or that other utilities are not within the area of operations. The Contractor shall make all necessary investigations to determine the existence and locations of such utilities far enough in advance of pipe laying to allow for adjustments due to conflicts in the horizontal and vertical positions of the pipeline.

1. Do not proceed with utility interruptions without receiving Architect's written permission.
2. Notify Architect not less than 48 hours in advance of proposed utility interruptions.
3. Do not interrupt existing utilities serving facilities occupied by others except when permitted by the utility owner and after arranging to provide acceptable temporary utility services.
4. Existing utilities across or along the line of work are indicated only in an appoximate location. Locate all underground lines and structures. Call "NC One Call" at 1-800-632-4949 prior to construction. If utilities are marked that are not shown on the plans, locate utility vertically and horizontally and provide information to architect. The contractor shall pay for any damage to and for maintenance and protection of existing utilities and structures.

D. Connections to Existing System:

1. Before the start of the construction, the Contractor shall dig test pits on all crossings of and connections to the existing system, as applicable, to determine the existing system location, size, and piping material. If the location, size, and piping material differs from that shown on the Drawings, notify Engineer immediately.
2. The Contractor shall make connections to the existing system under a pressure or non-presure condition, as indicated, complying with the system owner's requirements for the time of day such work can be done. The Contractor shall pay all costs associated with the connections unless otherwise indicated. If the system owner performs the work, the Contractor shall arrange for the work to be done.
3. Valves are to be operated only by the Owner.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate with interior building sanitary drainage piping.

B. Coordinate with other utility work.

C. Utility interruptions shall be coordinated with local utility provider. Written notice 72 hours in advance of utility interruption shall be provided to all affected customers.

PART 2 - PRODUCTS

2.1 PIPE AND PIPE LINING

A. General: Provide pipe materials and fittings compatible with each other.

B. Gravity Sewer Pipe:

1. Polyvinylchloride (PVC) Sewer:

a) Polyvinylchloride (PVC) non-pressure pipe (4”-15”) shall meet requirements of ASTM D3034, Type PSM, with maximum SDR of 21. Pipe joints shall be elastomeric gasket, push on type, meeting requirements of ASTM D3212. Cell classification for sewer pipe shall be 12454-B as defined in ASTM D1784. Solid wall PVC shall not be used for sewers larger than 15 inches in diameter.

2. Open Profile (PVC) Sewer:

a) PVC seamless pipe shall meet the requirements of ASTM F794or ASTM F949,latest revision. Polyvinyl compounds shall comply with a minimum cell classification of 12454B as specified in ASTM D1784. The pipe shall be homogeneous, and have a smooth interior with a solid cross-sectional exterior. Exterior shall be open profile with reinforcement perpendicular to the axis of the pipe to allow placement of the sealing gasket without field marking, beveling, sealing channels, gluing, welding, machining or additional cutting. The pipe stiffness at 5% deflection shall be a minimum of 46 psi when tested in accordance with ASTM D2412. Pipe shall meet ASTM D2444 requirements for impact resistance. Pipe shall have a 12 ft. minimum lay length. Each length of pipe shall be marked with the following information: size, company name or logo, PVC sewer pipe, ASTM F794 or F949designation, manufacturer’s code, and cell classification.

3. Closed Profile (PVC) Sewer:

a) PVC closed profile wall pipe shall meet the requirements of ASTM F794. Pipe shall be structurally engineered for high-capacity gravity flow applications and suitable for sanitary sewer applications. Pipe shall have a high chemical and corrosion resistance and be inherently resistant to chemicals commonly found in municipal sanitary sewer systems. Polyvinyl chloride compounds shall comply with a minimum cell classification of 12364A as defined by ASTM Specification D1784. All pipe joints shall be of the bell and spigot type with elastomeric seals and conform to the requirements of ASTM D3212. Gaskets shall be factory installed and chemically bonded to the bell end of the pipe. Gasket material shall conform to the requirements of ASTM F477. Joints shall be designed to sustain an angular deflection of up to 2° without leakage or loss of joint integrity.

b) Pipe shall exhibit a minimum stiffness of 46 psi when tested in accordance with ASTM D2412. A sample length of at least one pipe diameter shall be used as the reference test. No visual cracking or splitting shall be evidenced when tested in accordance with ASTM D2444 with a 30lb. weight, tup B, flatplate holder b to a level of 220 ft.-lb. There shall be no sign of flaking or disintegration of pipe when immersed in anhydrous acetone for 20 minutes as per ASTM D2152. Pipe shall show no evidence of cracking or splitting when pipe is flattened in a circumferential orientation between two flat plates to 60% of the original diameter. Each pipe shall pass a factory air test of 3.5 psi as described in ASTM F794.

c) Pipe shall be furnished free from any voids and hollows not associated with the closed profile design. Pipe shall be free from cracks, holes, foreign inclusions, etc. Pipe shall be manufactured in lengths of 13 ft. Pipe shall have a uniform inside and outside diameter along its length. Pipe color shall be white. Physical attributes of the pipe shall be as uniform as commercially practical. Each PVC closed profile wall pipe length and fitting shall be clearly marked with the following information: manufacturer's name, pipe size, cell classification ASTM F794 designation, Uni-bell Plastic Pipe Association designation, and pipe stiffness "PS-46 PSI".

4. Composite Polyvinylchloride (PVC) Sewer:

   a) Polyvinylchloride (PVC) shall meet all applicable requirements of ASTM D2680 and shall meet all performance standards of composite sewer pipe. Pipe joints shall be elastomeric gasket, push on type, in accordance with ASTM D3212. Polyvinyl compounds shall comply with a minimum cell classification of 12454B as specified in ASTM D1784. PVC composite sewer pipe shall be certified by the manufacturer for each total contract until an ASTM standard has been adopted. Bedding shall be as shown on the construction plans.

5. Protection of Plastic Pipe Materials:

   a) Before, during, and after installation, plastic pipe and fittings shall be protected from exposure to sunlight and any environment that would result in damage to or deterioration of the material. Pipe shall be covered with opaque plastic film. Solvents, solvent compounds, lubricants and any similar materials required to install the plastic pipe shall be stored in accordance with the manufacturer's recommendations and shall be discarded if the storage period exceeds the recommended shelf life.

2.2 FITTINGS

A. General: Provide pipe fitting materials compatible with each other.

B. Polyvinylchloride (PVC) Gravity Sewer:

1. Polyvinylchloride (PVC) non-pressure fittings (4"-15") shall meet requirements of ASTM D3034, Type PSM, SDR-35 with elastomeric gasket joints meeting requirements of ASTM D3212.

C. Sewer Saddles:

1. Applies to taps for service lines of 4 inches or 6 inches on main line pipe up to 12 inches.
2. Tapping saddles shall meet minimum working pressure requirements of 250 psi.
3. Straps shall be stainless steel, 24-guage, 2.5 inches wide
4. Nuts and bolts shall be stainless steel, 3/8-inch diameter.
5. Saddle shall be ductile iron, flanged faced, and drilled per ANSI B16.1 with standard tapping flange counterbore per MSS SP-60.
6. Adapter compatible with service line shall be secured to saddle with PVC sleeve.
7. Tapping sleeves are to be water pressure tested for leaks, through the test plug, for a period of five (5) minutes at 150 psi or as directed by the Engineer or Inspector.
8. Sewer saddles shall be as manufactured by one of the following:.

   a) ROMAC Industries, Inc

   b) GENCO (The General Engineering Co.)

   c) Inserta Fittings Company

2.3 SPECIAL PIPE COUPLINGS

A. Use flexible pipe couplings where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.

1. Use the following pipe couplings for non-pressure applications:

a) Sleeve type to join piping, of same size, or with small difference in OD.

b) Increaser/reducer-pattern, sleeve type to join piping of different sizes. Sleeve type shall be of the eccentric pattern.

2.4 DETECTABLE MARKING TAPE

A. Detectable marking tape shall be installed above all gravity sewer pipe, (including all service laterals).

B. Plastic marking tape shall consist of one layer of aluminum foil laminated between two layers of inert plastic film. Tape shall be resistant to alkalis, acids and other destructive agents commonly found in the soil. The laminate shall be strong enough that the layers cannot be separated by hand.

C. Tape shall be a minimum of 4-1/2 mils thick with a minimum tensile strength of 60 lbs. in the machine direction and 58 lbs. in the transverse direction per 3" wide strip. Tape color shall be APWA Color Coded for marking the particular utility line and shall be imprinted with a continuous warning message to indicate the type of utility being marked, the message normally being repeated every 16” to 36". Tape shall be inductively locatable and conductively traceable using a standard pipe and cable-locating device. Tape shall be 3" wide Terra Tape "Sentry Line Detectable 620," or approved equivalent.

2.5 CLEANOUTS

A. General: Provide cast-iron ferrule and countersunk brass cleanout plug, with round cast-iron access frame heavy-duty, secured, scoriated cast-iron cover.

B. Sewer pipe fitting and riser to cleanout shall be the same material as the run of pipe for which it serves.

2.6 SEWER LATERALS AND APPURTENANCES

A. Sewer Laterals:

1. Sewer laterals shall be service weight cast-iron soil pipe, coated, conforming to ASTM A74 or Schedule 40 PVC/DWV 1120 pipe, conforming to ASTM D1785, with a pressure rating of 220 psi. PVC pipe joints shall be solvent cemented in accordance with ASTM D2855.

2. The Contractor's attention is called to the fact that when schedule 40 PVC/DWV pipe is used for sewer laterals, the one-way clean-out and associated vertical stack shall be PVC/DWV as specified herein.

B. Sewer Laterals Wye Branches:

1. Sewer lateral wye branches shall be the same type material as the sewer main, and shall conform to the applicable sewer pipe specifications.

C. Sewer Lateral Cleanouts:

1. Sewer lateral cleanouts shall be a schedule 40 PVC 1120 pipe with a one-way schedule 40 PVC/DWV Long Sweep ¼ bend and cast soil pipe double hub coupling.

D. Sewer Cut-Ins:

1. Cut-ins shall be cast iron and used where new sewer laterals are connected to existing sewer mains.

PART 3 – EXECUTION

3.1 SEPARATION OF WATER LINES AND SANITARY AND/OR STORM SEWERS

A. Follow State Department of Environment and Natural Resources Division of Water Quality Standards for the separation of sanitary sewer and water distribution systems.

B. Parallel Installation

1. Normal Conditions - Sewer lines and manholes shall be constructed at least 10 feet horizontally from a waterline whenever possible. The distance shall be measured edge-to-edge.

2. Unusual Conditions - When local conditions prevent a horizontal separation of at least 10 feet, then maximum horizontal separation shall be provided with vertical separation of bottom of waterline at least 18 inches above top of sewer. Where this vertical separation cannot be obtained, the sewer shall be constructed of AWWA approved ductile iron pipe pressure-tested in place to 5 psi without leakage prior to backfilling. The sewer manhole shall be of watertight construction and tested in place.

C. Crossing:

1. Normal Conditions - Sewers crossing under waterlines shall be laid to provide a separation of at least 18 inches between the bottom of the waterline and the top of the sewer whenever possible.

2. Unusual Conditions - When local conditions prevent a vertical separation described in Crossing, Normal Conditions, paragraph above, the following construction shall be used:

a) Sewers passing over or under waterlines shall be constructed of ductile iron pipe with mechanical joints as described in Parallel Installation, Unusual Conditions above.

b) Sewers passing over waterlines shall be laid to provide:

i. Adequate structural support for the sewers to prevent excessive deflection of the joints and settling on and breaking waterline.

ii. Maximum separation of water and sewer line joints.

D. Sanitary and/or combined sewers or sewer manholes - No water pipes shall pass through or come in contact with any part of a sewer or sewer manhole.

3.2 EXCAVATING AND BACKFILLING

A. Excavation, trenching, backfilling and bedding for all piping specified herein shall conform to the applicable requirements of Section 31 23 00 (Trenching and Backfilling) and/or to details shown on the construction plans.

B. Remove any and all materials encountered in the course of excavating for all underground utility systems. Where the subgrade is found to be unstable or to include ashes, cinders, refuse, organic material, or other unsuitable material, such material shall be removed to a minimum of 3-inches, or to the depth ordered by the Engineer, and replaced under the directions of the Engineer with either No. 57 or 67 stone. The locations for trench undercutting, and the amount of stone to be used by the Contractor shall, in all cases, be designated by the Engineer. After the pipe is in place, backfill with suitable material, free from frozen earth, rocks, and organic materials.

1. Provide all necessary shoring required for the protection of excavations, existing utilities and workmen and do all necessary pumping required to keep excavation and pipe free from water from any source at all times.

2. Provide sufficient barricades adjacent to excavations to safeguard against injury to workmen and the public. Provide and maintain sufficient warning lanterns at walks, roadways, and parking areas to provide safety at all times.
3. Where roots of live trees are encountered in excavations, they shall be carefully protected during construction.
4. Exercise special care in backfilling trenches to guard against disturbing the joints.
5. Remove and dispose of any material not used for backfill.

C. Removal of subsurface obstructions which are uncovered during excavation for installation of the sanitary sewer systems shall be by the Contractor at his expense. This shall include removal of existing concrete or brick from existing building foundations, footings, abandoned utility piping, wires, structures, rock boulders, etc., which may not be visible from surface investigations before construction, but will interfere with new installations. If such obstructions are encountered, they shall be removed two feet from around the area of new work and the excavation backfilled with a suitable material as specified.

3.3 PIPE HANDLING

A. Take all precautions to ensure that pipe, fittings, and related items are not damaged in unloading, handling and placing in trench. Examine each piece of material just prior to installations to determine that no damage has occurred. Remove any damaged material from the site and replace with undamaged material.

B. Keep pipe clean. Exercise care to keep foreign material and dirt from entering pipe during storage, handling and placing in trench. Close ends of in-place pipe at the end of any work period to prevent entry of animals and foreign material.

C. Survey Line and Grade

1. Line and grade hubs shall be set by a registered surveyor, maintained by the Contractor, and the Architect provided with cut-sheets.
2. Contractor shall have level or transit in good working order on the job set up at all times to periodically check line and grade of pipe.

3.4 GRAVITY SEWER PIPE LAYING

A. Laying of sewer pipe shall be accomplished to line and grade as indicated on the contract drawings and in the trench only after it has been dewatered and the foundation and/or bedding has been prepared. Mud, silt, gravel, and other foreign material shall be kept out of the pipe and off the jointing surfaces. Do not lay pipe when weather or trench conditions are unsuitable.

B. Pipe and fittings shall be strung out along the route of construction with the bells facing in the direction in which the work is to proceed. Pipe shall be placed where it will cause the least interference with traffic. Laying of the pipe shall be commenced immediately after the excavation is started and every means must be used to keep pipe laying closely behind the trenching. The Engineer may stop the trenching when, in his opinion, the trench is open too far in advance of the pipe laying operation. The bottom of the sewer trench shall be shaped to give substantially uniform circumferential support to the lower on-third of each pipe. Holes shall be scooped out where the bells occur leaving the entire barrel of the pipe bearing on the pipe bed.

C. All pipe laid shall be retained in position so as to maintain alignment and joint closure until sufficient backfill has been completed to adequately hold the pipe in place. All pipe shall be laid to conform to the prescribed line and grade shown on the contract drawings. After completion the pipe shall exhibit a full circle of light at one manhole when viewed from the next.

D. The sewer pipe shall be laid upgrade from point of connection to the existing sewer or from a designated starting point. If the starting point is at an existing stub, it shall be removed and a full length of pipe installed. The sewer pipe shall be installed with the bell end forward or upgrade. When pipe laying is not in progress, the forward end of the pipe shall be kept tightly closed with a water tight plug or cap. When the upstream end of a sewer does not terminate at a manhole, it shall be plugged and its location marked in a manner approved by the Inspector.

E. The pipe shall be fitted and matched so that when installed it will form a smooth, uniform invert.

F. Prior to joining the pipe, all surfaces of the pipe to be joined and the surfaces of factory made jointing materials shall be clean and dry. Lubricants, primers, adhesives, etc., shall be applied and the pipes joined as recommended by the manufacturer's specifications. Sufficient pressure shall be applied in making the joint to assure that the pipe is "home". The interior of the pipe shall be cleaned of all foreign material as the work progresses. At the end of the work day, the last pipe laid shall be blocked to prevent creep, and closed with a water tight plug or cap.

G. Joining Pipe

1. Polyvinyl chloride (PVC) pipe shall be joined in accordance with ASTM Standard D-2321.

2. Other type pipe shall be joined in accordance with the manufacturer's recommendations and the requirements of the County approved plans and specifications.

H. All visible leaks shall be corrected prior to testing.

3.5 DETECTABLE MARKING TAPE

A. Install detectable marking tape in all trenches containing buried, non-metallic, pipelines. Tape shall be installed in all trenches with a cover of 18" to 54" and a minimum clearance over the pipelines of 18". Tape shall be made electrically conductive throughout the entire system through the use of splices of a type recommended by the manufacturer.

3.6 ROAD/HIGHWAY CROSSINGS

A. Where crossing is to be installed beneath a North Carolina state road or highway, all operations and materials shall conform to the requirements of the North Carolina Department of Transportation governing such crossings, and the contractor shall obtain approval of all materials and methods to be employed before such work is started. A copy of such permission shall be filed with the Owner prior to starting the work.

B. The contractor will also be required to furnish a release from the proper authorities before final acceptance of the work by the Owner.

C. The contractor shall secure from the Department of Transportation the necessary information regarding proper bracing, sheeting, shoring and other required protection of the highway and traffic during the construction operation.

D. Where an open cut is permissible in crossing the State Highway instead of boring, the contractor shall make the necessary provisions for handling traffic and replacing the roadbed and surface as required by the North Carolina Department of Transportation.

E. Contractor shall be responsible for the payment of all fees required to obtain the necessary permits

3.7 CLEAN UP

A. Upon the completion of the installation of the sanitary sewer system and prior to acceptance, sediment and debris shall be removed from the limits of construction. All trash and debris shall be removed and properly disposed of. Areas not otherwise stabilized shall be seeded and mulched and a good stand of grass established.

PART 4 –TESTING

4.1 TESTING

A. Gravity Sewers

1. Testing of gravity sewer lines shall be conducted on short sections of sewer line, i.e., between manholes. Provide all labor, materials, tools, and equipment necessary to make the tests, and ensure that zero infiltration is provided. All equipment and methods used shall be acceptable to the Engineer and the Owner. All monitoring gages shall be subject to calibration, if deemed necessary.

2. Sanitary sewer lines 24 in. diameter and smaller shall be tested after backfill using a low-pressure air test in accordance with ASTM C924.

3. Summary of Method: Plug the section of the sewer line to be tested. One of the plugs used at the manhole must be tapped and equipped for the air inlet connection for filling the line from the air compressor. Introduce low-pressure air into the plugged line. Use the quantity and rate of air loss to determine the acceptability of the section being tested.

4. Preparation of the sewer line: Flush and clean the sewer line prior to testing, thus serving to wet the pipe surface as well as clean out any debris. A wetted interior pipe surface will produce more consistent results. Plug all pipe outlets using approved pneumatic plugs with a sealing length equal to or greater than the diameter of the line being tested to resist the test pressure. Give special attention to laterals.

5. Groundwater Determination: Install a ½-inch capped galvanized pipe nipple, approximately 12 inches long, through the manhole on top of the lowest sewer line in the manhole. Immediately prior to the line acceptance test, the ground water elevation shall be determined by removing the pipe cap and blowing air through the pipe nipple into the ground so as to clear it, and then connecting a clear plastic hose to the pipe nipple. The hose shall be held vertically and a measurement of the height in feet of water over the invert of the pipe shall be taken after the water has stopped rising in the plastic hose.

6. Procedures: Determine the test duration for the section under test by computation from the applicable formulas shown in ASTM C828. The pressure-holding time is based on an average holding pressure of 3 psi gage or a drop from 3.5 psi to 2.5 psi gage.

   a) Add air until the internal air pressure of the sewer line is raised to approximately 4.0 psi gage. After an internal pressure of approximately 4.0 psig is obtained, allow time for the air pressure to stabilize. The pressure will normally show some drop until the temperature of the air in the test section stabilizes.

   b) When the pressure has stabilized and is at or above the starting test pressure of 3.5 psi gage, commence the test. Before starting the test, the pressure may be allowed to drop to 3.5 psig. Record the drop in pressure for the test period. If the pressure has dropped more than 0.5 psi gage during the test period, the line shall be presumed to have failed. The test may be discontinued when the prescribed test time has been completed even though the 0.5 psig drop has not occurred.

   c) The test procedure may be used as a presumptive test, which enables the installer to determine the acceptability of the line prior to backfill and subsequent construction activities.

   d) If the pipe to be tested is submerged in ground water, the test pressure shall be increased to 1.0 psi for every 2.31 feet the ground water level is above the invert of the sewer.

7. Safety: The air test may be dangerous if, because of lack of understanding or carelessness, a line is improperly prepared.

   a) It is extremely important that the various plugs be installed and braced in such a way as to prevent blowouts. In as much as a force of 250 lbs. is exerted on an 8 inch plug by an internal pipe pressure of 5 psi, it should be realized that sudden expulsion of a poorly installed plug or of a plug that is partially deflated before the pipe pressure is released can be dangerous.

b) As a safety precaution, pressurized equipment shall include a regulator or relief valve set at perhaps 10 psi to avoid over-pressurizing and damaging an otherwise acceptable line. No one shall be allowed in the manholes during testing.

B. Video Inspection of Sewer Lines

1. The contractor will be responsible to perform a video inspection of the sewer line once it is completed and cleaned. Television inspection information will be provided to the site Engineer for all public mains and connecting services, up to the cleanout. The site Engineer will review the approved recorded information and contact the appropriate parties to confirm the results. The site Engineer will be provided a report with each section identified and linked to either a VHS tape or DVD disc with all inspection footage included for each section. Quality of video inspection will be to industry acceptable standards clearly showing any potential defects.
2. There will be no direct payment made for TV inspection as the cost will be incidental to other pay items in the contract. Refer to the following guidelines for TV inspection.
3. Prior to being approved to perform any independent video inspection the firm should show examples of their work, quality of tapes and print out of on screen data (a previous project would be good). This should be submitted to the site Engineer.
4. Approved “As- Built “plans will be required for TV inspection.
5. Sewer under pavement is not considered complete until any required pavement binder is in place and manhole rims are adjusted to grade with the sewer line cleaned out.
6. All tapes shall be recorded on “VHS” format at “SP” speed or on DVD.
7. Every foot of pipe shall be recorded with zero beginning at first manhole and ending with next manhole.
8. Laterals shall be filmed from base of cleanout to the main.
9. The camera should have pan and tilt capabilities to viewing the pipe at 360 degrees with on screen print out of data.
10. A report form for every segment of line shall be submitted, this should include the firm submitting the report, date, project, upstream and downstream invert elevations, manhole depths, length between manholes, pipe diameter and material type.
11. Any video inspection report that doesn’t clearly show the line and connecting service laterals and are not meeting the above requirements and will be rejected.
12. In the event that repairs are required, affected segment or segments of line will need to be inspected by means of the video inspection process for final approval.

PART 5 – WORK COMMON TO SEWER LINE CONSTRUCTION

5.1 GENERAL

A. All work described herein is to be performed in accordance with the requirements in the drawings and the provisions of these specifications.

5.2 ROCK EXCAVATION:

A. The work covered by this Article consists of blasting, excavating, removing and disposing of rock from water and sewer trenches.

B. Rock, under this Article, is defined as solid, ledge rock in place in a water or sewer trench which, in the opinion of the Engineer, cannot be removed practically without the use of drilling and blasting or special techniques such as drilling and wedging. Excavated boulders or rock fragments with a volume over ½ cubic yards may be classified as rock by the Engineer.

5.3 REPLACEMENT OF BACKFILL MATERIAL

A. The work covered by this Article consists of disposing of unsuitable excavated material and furnishing, placing, and compacting approved backfill material.

B. Construction requirements:

1. Where, in the opinion of the Engineer, material excavated from the trench is unsuitable to be used as backfill material the Contractor shall provide backfill material that is approved by the Engineer.

2. Where, in the opinion of the Engineer, material excavated from the trench is a suitable soil type to be used as backfill material but contains excessive moisture the following three conditions shall prevail:

a) The Contractor shall reduce the moisture content of the material to an acceptable level by aerating the material adjacent to the excavated trench. No direct payment will be made for aerating the excavated material as such work will be considered incidental to other work being paid for by the various items in the contract.

b) Where the area available to aerate the excavated material is limited or insufficient, and the moisture content is above optimum for the type of soil, but compaction is attainable with extra compactive effort, the Contractor shall use extra compactive effort in the backfilling operation to obtain a soil density of 95% of Standard Proctor Density. No direct payment will be made for the extra compactive effort as such work will be considered incidental to other work being paid for by the various items in the contract.

c) Where the area available to aerate the excavated material is limited or insufficient and the moisture content is above optimum for the type of soil, and satisfactory compaction is determined by the Engineer to be unattainable, the Engineer will authorize the Contractor to provide approved backfill material.

5.4 REMOVE AND REPLACE PAVEMENT FOR PIPES AND STRUCTURES

A. The work covered by this Article consists of replacing a bituminous pavement structure in areas where the Contractor removed pavement for the installation of pipe lines and appurtenances.

B. Construction Requirements:

1. The pavement replacement structure shall be constructed in accordance with most current “Standard Specifications for Roads and Structures" published by the NCDOT.

2. The Contractor shall trim or saw a neat edge along the pavement to be retained, using methods approved by the Engineer.

3. The materials and construction methods used for the pavement structure replacement shall meet all the requirements of the most current “Standard Specifications for Roads and Structures" published by the NCDOT.

5.5 REMOVE AND REPLACE CONCRETE FLATWORK

A. The work covered by this Article consists of replacing concrete sidewalks, driveways, and miscellaneous slabs that have been removed by the Contractor for the installation of pipe lines and appurtenances.

B. Construction Requirements:

1. The concrete flatwork replacement shall be constructed in accordance with all applicable provisions of the most current “Standard Specifications for Roads and Structures" published by the NCDOT and the following provisions.

2. The Contractor will be required to furnish a neat edge along the concrete pavement retained by sawing a neat line approximately two inches deep, with a concrete saw, before breaking the adjacent concrete pavement away.
3. The concrete replacement shall be constructed in accordance with the details shown in the drawings or as directed by the Engineer.
4. Concrete forms shall be constructed to shape, line, and dimension as indicated in the drawings or directed by the Engineer. Forms shall be braced and tied together to prevent displacement during the concrete pouring and finishing operations.
5. The Contractor shall provide a finish on the replacement concrete that matches the adjacent concrete retained.

5.6 REMOVE AND REPLACE CONCRETE CURB AND GUTTER

A. At the locations shown on the drawings or designated by the Engineer the Contractor shall remove the existing concrete curb and gutter necessary for the installation of pipe lines. The removed concrete curb and gutter shall be disposed of by the Contractor in waste areas provided by him.

B. After the installation of the pipe lines the Contractor shall replace the removed curb and gutter with new concrete curb and gutter. The new concrete curb and gutter shall be constructed in accordance with a most current “Standard Specifications for Roads and Structures" published by the NCDOT.

5.7 INCIDENTAL ABC STONE BASE

A. The work covered by this Article consists of furnishing and placing a graded stone material for use in driveways, pavement cuts, temporary maintenance of traffic, and at locations directed by the Engineer.

1. Construction Requirements: The graded stone material shall meet the requirements of the most current “Standard Specifications for Roads and Structures" published by the NCDOT for ABC Stone.
2. The graded stone material shall be uniformly spread over the area required and then shaped and dressed to the satisfaction of the Engineer. The stone material shall be maintained until final acceptance of the individual project by reshaping and by addition of stone material when directed by the Engineer.
3. In pavement cuts, the stone material shall be placed and compacted to 95% of Standard Proctor Density.

END OF SECTION

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 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 _____

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 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 _____

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 _____

APPENDIX E

MBE DOCUMENTATION FOR CONTRACT PAYMENTS

Prime Contractor/Architect: _____

Address & Phone: _____

Project Name: _____

Pay Application #: _____ Period: _____

The following is a list of payments to be made to minority business contractors on this project for the above-mentioned period.

Firm Name	*Minority Category	Payment Amount	Owner Use Only

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

Date: _____ Approved/Certified By: _____
Name

_____
Title

_____
Signature

****THIS DOCUMENT MUST BE SUBMITTED WITH EACH PAY REQUEST & FINAL PAYMENT****

FORM OF BID BOND

KNOW ALL MEN BY THESE PRESENTS THAT _____ _____ as principal, and _____, as surety, who is duly licensed to act as surety in North Carolina, are held and firmly bound unto the State of North Carolina***** through _____ as obligee, in the penal sum of _____ DOLLARS, lawful money of the United States of America, for the payment of which, well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

Signed, sealed and dated this ____ day of _____ 20__

WHEREAS, the said principal is herewith submitting proposal for and the principal desires to file this bid bond in lieu of making the cash deposit as required by G.S. 143-129.

NOW, THEREFORE, THE CONDITION OF THE ABOVE OBLIGATION is such, that if the principal shall be awarded the contract for which the bid is submitted and shall execute the contract and give bond for the faithful performance thereof within ten days after the award of same to the principal, then this obligation shall be null and void; but if the principal fails to so execute such contract and give performance bond as required by G.S. 143-129, the surety shall, upon demand, forthwith pay to the obligee the amount set forth in the first paragraph hereof. Provided further, that the bid may be withdrawn as provided by G.S. 143-129.1

_____(SEAL)

_____(SEAL)

_____(SEAL)

_____(SEAL)

_____(SEAL)

F O R M O F P R O P O S A L

Wagram Equipment Shop Contract:_____

NC Department of Transportation Bidder: _____

SCO ID No. 14-11279-01A Date:_____

The undersigned, as bidder, hereby declares that the only person or persons interested in this proposal as principal or principals is or are named herein and that no other person than herein mentioned has any interest in this proposal or in the contract to be entered into; that this proposal is made without connection with any other person, company or parties making a bid or proposal; and that it is in all respects fair and in good faith without collusion or fraud. The bidder further declares that he has examined the site of the work and the contract documents relative thereto, and has read all special provisions furnished prior to the opening of bids; that he has satisfied himself relative to the work to be performed. The bidder further declares that he and his subcontractors have fully complied with NCGS 64, Article 2 in regards to E-Verification as required by Section 2.(c) of Session Law 2013-418, codified as N.C. Gen. Stat. § 143-129(j).

.

The Bidder proposes and agrees if this proposal is accepted to contract with the

North Carolina Department of Transportation

in the form of contract specified below, to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation and labor necessary to complete the construction of

Wagram Equipment Shop

in full in complete accordance with the plans, specifications, and contract documents, to the full and entire satisfaction of the ***State of North Carolina***, and the

North Carolina Department of Transportation

with a definite understanding that no money will be allowed for extra work except as set forth in the General Conditions and the contract documents, for the sum of:

SINGLE PRIME CONTRACT:_____

Base Bid:

_____Dollars ($)_____

General Subcontractor:

_____Lic_____

Plumbing Subcontractor:

_____Lic_____

Mechanical Subcontractor:

_____Lic_____

Electrical Subcontractor:

_____Lic_____

GS143-128(d) requires all single prime bidders to identify their subcontractors for the above subdivisions of work. A contractor whose bid is accepted shall not substitute any person as subcontractor in the place of the subcontractor listed in the original bid, except (i) if the listed subcontractor's bid is later determined by the contractor to be non-responsible or non-responsive or the listed subcontractor refuses to enter into a contract for the complete performance of the bid work, or (ii) with the approval of the awarding authority for good cause shown by the contractor.

ALTERNATES:

Should any of the alternates as described in the contract documents be accepted, the amount written below shall be the amount to be "added to" or "deducted from" the base bid. (Strike out "Add" or "Deduct" as appropriate.)

GENERAL CONTRACT:

Alternate #1: Construct 1000 sq. ft. Tire Storage Building shown on Sheet S6, A8.0, & PME-1, & C2.0.

(Add) Dollars($)

Alternate #2: Provide pavement at Area 1 (front of Shop) in lieu of gravel base bid as shown on Civil drawings.

(Add) Dollars($)

Alternate #3: Provide pavement at Area 1 (front of Shop) and Area 2 (side driveways) in lieu of gravel base bid as shown on Civil drawing C2.0.

(Add) Dollars($)

Alternate #4: Provide pavement at Area 1 (front of Shop), Area 2 (side driveways), and Area 3 (back of Shop) in lieu of gravel base bid as shown on Civil drawing C2.0.

(Add) Dollars($)

Alternate #5: Provide LED lights in lieu of fluorescent lights base bid shown on Electrical drawing E5.

(Add) Dollars($)

UNIT PRICES

Unit prices quoted and accepted shall apply throughout the life of the contract, except as otherwise specifically noted. Unit prices shall be applied, as appropriate, to compute the total value of changes in the base bid quantity of the work all in accordance with the contract documents.

GENERAL CONTRACT:

No. 1	Remove Unsuitable Soils, Site/Civil	Per Cubic Yard	Unit Price $_____/CY
No. 2	Geotextile Fabric	Per Square Yard	Unit Price $_____/SY

The bidder further proposes and agrees hereby to commence work under this contract on a date to be specified in a written order of the designer and shall fully complete all work thereunder within the time specified in the Supplementary General Conditions Article 23. Applicable liquidated damages amount is also stated in the Supplementary General Conditions Article 23.

MINORITY BUSINESS PARTICIPATION REQUIREMENTS

Provide with the bid - Under GS 143-128.2(c) the undersigned bidder shall identify **on its bid**

(Identification of Minority Business Participation Form) the minority businesses that it will use on the project with the total dollar value of the bids that will be performed by the minority businesses. **Also** list the good faith efforts (Affidavit **A**) made to solicit minority participation in the bid effort.

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

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

An Affidavit (**C**) that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the 10% goal established. This affidavit shall give rise to the presumption that the bidder has made the required good faith effort and Affidavit **D** is not necessary;

*** OR ***

If less than the 10% goal, Affidavit (**D**) of its good faith effort to meet the goal shall be provided. The document must include evidence of all good faith efforts that were implemented, including any advertisements, solicitations and other specific actions demonstrating recruitment and selection of minority businesses for participation in the contract.

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

Proposal Signature Page

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

Respectfully submitted this day of _____

_____
(Name of firm or corporation making bid)

WITNESS:

_____
(Proprietorship or Partnership)

By: _____
Signature

Name: _____
Print or type

Title _____
(Owner/Partner/Pres./V.Pres)

Address _____

_____

ATTEST:

By: _____

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

License No. _____

Federal I.D. No. _____

Email Address: _____

(CORPORATE SEAL)

Addendum received and used in computing bid:

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

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

FORM OF CONSTRUCTION CONTRACT

(ALL PRIME CONTRACTS)

THIS AGREEMENT, made the _____ day of _____ in the year of 20__ by and between _____ _____ hereinafter called the Party of the First Part and the State of North Carolina, through the Department of Transportation hereinafter called the Party of the Second Part.

WITNESSETH:

That the Party of the First Part and the Party of the Second Part for the consideration herein named agree as follows:

1. Scope of Work: The Party of the First Part shall furnish and deliver all of the materials, and perform all of the work in the manner and form as provided by the following enumerated plans, specifications and documents, which are attached hereto and made a part thereof as if fully contained herein: advertisement; Instructions to Bidders; General Conditions; Supplementary General Conditions; specifications; accepted proposal; contract; performance bond; payment bond; power of attorney; workmen's compensation; public liability; property damage and builder's risk insurance certificates; approval of attorney general; certificate by the Office of State Budget and Management, and drawings, titled: **Wagram Equipment Shop, Laurinburg, NC.** Consisting of the following sheets:

Dated: May 27, 2016 and the following addenda:

Addendum No	_____	Dated:	_____	Addendum No.	_____	Dated:	_____
Addendum No	_____	Dated:	_____	Addendum No.	_____	Dated:	_____
Addendum No	_____	Dated:	_____	Addendum No.	_____	Dated:	_____
Addendum No	_____	Dated:	_____	Addendum No.	_____	Dated:	_____

2. That the Party of the First Part shall commence work to be performed under this agreement on a date to be specified in a written order of the Party of the Second Part and shall fully complete all work hereunder within 300 consecutive calendar days from said date. For each day in excess thereof, liquidated damages shall be as stated in Supplementary General Conditions. The Party of the First Part, as one of the considerations for the awarding of this contract, shall furnish to the Party of the Second Part a construction schedule setting forth planned progress of the project broken down by the various divisions or part of the work and by calendar days as outlined in Article 14 of the General Conditions of the Contract.

3. The Party of the Second Part hereby agrees to pay to the Party of the First Part for the faithful performance of this agreement, subject to additions and deductions as provided in the specifications or proposal, in lawful money of the United States as follows:

_____ _____ ($ _____).

Summary of Contract Award:

4. In accordance with Article 31 and Article 32 of the General Conditions of the Contract, the Party of the Second Part shall review, and if approved, process the Party of the First Party's pay request within 30 days upon receipt from the Designer. The Party of the Second Part, after reviewing and approving said pay request, shall make payments to the Party of the First Part on the basis of a duly certified and approved estimate of work performed during the preceding calendar month by the First Party, less five percent (5%) of the amount of such estimate which is to be retained by the Second Party until all work has been performed strictly in accordance with this agreement and until such work has been accepted by the Second Party. The Second Party may elect to waive retainage requirements after 50 percent of the work has been satisfactorily completed on schedule as referred to in Article 31 of the General Conditions.

5. Upon submission by the First Party of evidence satisfactory to the Second Party that all payrolls, material bills and other costs incurred by the First Party in connection with the construction of the work have been paid in full, final payment on account of this agreement shall be made within thirty (30) days after the completion by the First Party of all work covered by this agreement and the acceptance of such work by the Second Party.

6. It is further mutually agreed between the parties hereto that if at any time after the execution of this agreement and the surety bonds hereto attached for its faithful performance, the Second Party shall deem the surety or sureties upon such bonds to be unsatisfactory, or if, for any reason, such bonds cease to be adequate to cover the performance of the work, the First Party shall, at its expense, within five (5) days after the receipt of notice from the Second Party so to do, furnish an additional bond or bonds in such form and amount, and with such surety or sureties as shall be satisfactory to the Second Party. In such event no further payment to the First Party shall be deemed to be due under this agreement until such new or additional security for the faithful performance of the work shall be furnished in manner and form satisfactory to the Second Party.

7. The Party of the First Part attest that it and all of its subcontractors have fully complied with all requirements of NCGS 64 Article 2 in regards to E-Verification as required by Section 2.(c) of Session Law 2013-418, codified as N.C. Gen. Stat. § 143-129(j).

IN WITNESS WHEREOF, the Parties hereto have executed this agreement on the day and date first above written in _____ counterparts, each of which shall without proof or accounting for other counterparts, be deemed an original contract.

Witness:

_____
Contractor: (Trade or Corporate Name)

_____
(Proprietorship or Partnership)

By: _____

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

Attest: (Corporation)

By: _____

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

The State of North Carolina through*

(CORPORATE SEAL)

_____
(Agency, Department or Institution)

Witness:

_____

By:_____

Title: _____

Form OC-13

SECTION 307 FORM OF PERFORMANCE BOND

Date of Contract: _____

Date of Execution: _____

Name of Principal: _____
(Contractor)

Name of Surety: _____

Name of Contracting Body: _____

Amount of Bond: _____

Project: _____

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

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

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

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

Executed in _____ counterparts.

Witness:

Contractor: (Trade or Corporation Name)

_____ By:
(Proprietorship or Partnership)

Attest: (Corporation) Title:
(Owner, Partner, or Corp. President
or Vice President only)

By: _____

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

(Corporate Seal)

Witness: (Surety Company)

_____ By:

Title:
(Attorney in Fact)

Countersigned:

_____ (Surety Corporate Seal)

(N.C. Licensed Resident Agent)

(Name and Address-Surety Agency)

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

Form OC-10

SECTION 308 FORM OF PAYMENT BOND

Date of Contract: _____

Date of Execution: _____

Name of Principal: _____
(Contractor)

Name of Surety: _____

Name of Contracting Body: _____

Amount of Bond: _____

Project: _____

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

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

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

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

Executed in _____ counterparts.

Witness:

Contractor: (Trade or Corporation Name)

_____ By:
(Proprietorship or Partnership)

Attest: (Corporation) Title:
(Owner, Partner, or Corp. President
or Vice President only)

By: _____

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

(Corporate Seal)

Witness: (Surety Company)

_____ By:

Title:
(Attorney in Fact)

Countersigned:

_____ (Surety Corporate Seal)

(N.C. Licensed Resident Agent)

(Name and Address-Surety Agency)

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

SHEET FOR ATTACHING POWER OF ATTORNEY

SHEET FOR ATTACHING CERTIFICATE OF INSURANCE

SECTION 309 APPROVAL OF THE ATTORNEY GENERAL

CERTIFICATION BY THE OFFICE OF STATE BUDGET AND MANAGEMENT

Provision for the payment of money to fall due and payable by the

_____

under this agreement has been provided for by allocation made and is available for the purpose of carrying out this agreement.

This _____day of _____ 20___.

Signed _____
Budget Officer

CERTIFICATION BY THE OFFICE OF STATE BUDGET AND MANAGEMENT

Provision for the payment of money to fall due and payable by the

_____

under this agreement has been provided for by allocation made and is available for the purpose of carrying out this agreement.

This _____day of _____ 20___.

Signed _____
Budget Officer