

PROJECT MANUAL FOR

Cafeteria Addition To
Overhills High School
Harnett County Schools

Harnett County, North Carolina

Hite associates
ARCHITECTURE / PLANNING / TECHNOLOGY

2600 Meridian Drive / Greenville, NC 27834 / tel 252.757.0333 / fax 252.757.1330 / www.hiteassoc.com

December 1, 2017

NOTICE TO BIDDERS

Sealed proposals from selected bidders will be received by Harnett County Schools, **FILL IN DATE** _____ at the offices of Harnett County Schools Facilities Services, 1500 South Main Street, Lillington, NC 27546. Single Prime Bids for site, general, plumbing, mechanical and electrical construction, will be accepted up to 3:00 p.m. for the furnishing of labor, material and equipment entering into the construction of the Cafeteria Addition to Overhills High School. Bids shall be marked "SEALED BID", addressed to the attention of Mr. Daren McLean, Harnett County Schools, and shall include the Name, Address, and License Number of the Bidder, and the type proposal enclosed.

Bids will be received as follows:

1. Single Prime Contract (site, general, plumbing, mechanical, and electrical)

Complete plans, specifications and contract documents are available on the Hite Associates website, www.hiteassoc.com ; and will be open for inspection in the office of the Architect, Hite Associates, 2600 Meridian Drive, Greenville, North Carolina, 27834, and; may be obtained by purchased by calling Speedyblue Reprographics at (252) 758-1616, print@speedyblue.com.

There will be a Pre-Bid Conference **FILL IN DATE** _____, at 3:00 p.m., at the offices of Harnett County Schools Facilities Services, 1500 South Main Street, Lillington, NC 27546.

All Contractors are hereby notified that they must have proper license under the State laws governing their respective trades.

General Contractors are notified that Chapter 87, Article I, General Statutes of North Carolina, will be observed in receiving bids and awarding the General Contract. General Contractors submitting bids on this project must have proper license classification.

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 such bonds, conditioned that the surety will, upon demand forthwith make payment to the obligee upon said bond if the bidder fails 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. In determining the value of the bid bond, additive or deductive alternates shall be considered as they are accepted by the Owner.

NOTICE TO BIDDERS

A Performance Bond and a Labor and Materials Payment Bond will be required for one hundred percent (100%) of the contract price.

Payment will be made on the basis of 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 60 days after the bid date.

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

SIGNED: _____

DESIGNER: HITE ASSOCIATES, P.C.
2600 Meridian Drive
Greenville, North Carolina 27834

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AIA[®] Document A701[™] – 1997

Instructions to Bidders

for the following PROJECT:

(Name and location or address)

Cafeteria Addition to Overhills High School
Overhills High School
2495 Ray Road
Spring Lake, NC 28390

THE OWNER:

(Name, legal status and address)

Harnett County Board of Education
1108 S. 11th Street
Lillington, NC 27546

THE ARCHITECT:

(Name, legal status and address)

Hite Associates, P.C.
2600 Meridian Drive
Greenville, NC 27834

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ADDITIONS AND DELETIONS:

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

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

ARTICLE 1 DEFINITIONS

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

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

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

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

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

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

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

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

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

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 The Bidder by making a Bid represents that:

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

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

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

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

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 COPIES

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

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

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

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

§ 3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

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

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

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

§ 3.3 SUBSTITUTIONS

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

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

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

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

§ 3.4 ADDENDA

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

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

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

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

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 PREPARATION OF BIDS

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

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

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

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

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

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

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

§ 4.2 BID SECURITY

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

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

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

§ 4.3 SUBMISSION OF BIDS

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

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

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

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

§ 4.4 MODIFICATION OR WITHDRAWAL OF BID

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

§ 4.4.2 Prior to the time and date designated for receipt of Bids, a Bid submitted may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the signature of the Bidder. Written confirmation over the signature of the Bidder shall be received, and date- and time-stamped by the receiving party on or before the date and time set for receipt of Bids. A change shall be so worded as not to reveal the amount of the original Bid.

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

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

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 OPENING OF BIDS

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

§ 5.2 REJECTION OF BIDS

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

§ 5.3 ACCEPTANCE OF BID (AWARD)

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

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

ARTICLE 6 POST-BID INFORMATION

§ 6.1 CONTRACTOR'S QUALIFICATION STATEMENT

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

§ 6.2 OWNER'S FINANCIAL CAPABILITY

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

§ 6.3 SUBMITTALS

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

- .1 a designation of the Work to be performed with the Bidder's own forces;
- .2 names of the manufacturers, products, and the suppliers of principal items or systems of materials and equipment proposed for the Work; and
- .3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

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

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder in writing if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, (1) withdraw the Bid or (2) submit an acceptable substitute person or entity with an adjustment in the Base Bid or Alternate Bid to cover the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

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

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 BOND REQUIREMENTS

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

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

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

§ 7.2 TIME OF DELIVERY AND FORM OF BONDS

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

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

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

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

ARTICLE 8 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

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

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

ARTICLE 3

ADD subparagraph 3.4: In addition to obtaining Bidding Documents from the Hite Associates website, qualified bidders, subcontractors, material suppliers may obtain complete or partial sets of the Drawings Bidding Documents and specifications from SpeedyBlue Printers for the cost of printing and mailing.

ARTICLE 4

ADD: Bidders must identify the type of proposal clearly on the Bid Envelope, and include State License number thereon.

ARTICLE 7

ADD: Furnish Performance Bond in the amount of the Contract Price, covering faithful performance of contract and payment of all obligations arising thereunder on AIA Document A312.

FORM OF PROPOSAL

From: _____ Contract: GENERAL

Address: _____

To: Harnett County 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 informed himself fully in regard to all conditions pertaining to the places where the work is to be done, that he has examined the specifications for the work and the contract documents relative thereto, and has read all special provisions furnished prior to the opening of bids; that he has satisfied himself relative to the work to be performed.

The Bidder proposes and agrees if this proposal is accepted to contract with the County of Harnett through the Harnett County Board of Education 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 the: Cafeteria Addition for Overhills High School in full in complete accordance with the plans, specifications and contract documents, to the full and entire satisfaction of the Owner and / or Architect, 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(\$)

Plumbing Subcontractor: _____

Electrical Subcontractor: _____

Mechanical Subcontractor: _____

HVAC Controls Subcontractor: _____

ALTERNATES:

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

ALTERNATE NO. 1 Shall be the amount added to the Base Bid to provide Open Options for the security system controllers and programing to be installed by a certified and licensed Open Options installer.

(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 scope of the work all in accordance with the contract documents.

ITEM #	DESCRIPTION	UNIT PRICE
1	Unclassified Excavation (Disposal OFF Site)	_____ c.y. (cubic yard)
2	Mass Under Cut Excavation (Disposal OFF Site)	_____ c.y. (cubic yard)
3	Foundation Under Cut Excavation (Disposal OFF Site)	_____ c.y. (cubic yard)
4	Off-Site Select Borrow Fill	_____ c.y. (cubic yard)
5	#57 or #67 Stone (Building foundations)	_____ c.y. (square yard)
12	4" Thick Concrete Sidewalk	_____ s.y. (square yard)

NOTE: "Installed" means undercut and fill are measured compacted and in place, not by truckload or prior to compaction.

BRICK QUANTITY

General Contractors shall indicate below the specific quantity of brick to be used. It is agreed that this quantity shall be used in adjusting the final contract amount for the actual cost of brick purchased.

Brick Quantity: _____

TIME

The Bidder further proposes and agrees hereby to commence work on a date specified in the Architect's Notice to Proceed, and to complete all work according to the schedule of dates set under Article 8 "Time" of the Supplementary Conditions, WHICH ARE DATES CERTAIN, with no allowance for delays except as may be caused by the Owner. Applicable liquidated damages shall be as stated in the Supplementary General Conditions.

HUB PARTICIPATION REQUIREMENTS;

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

Note:

Bidders must always submit **with their bid** the Identification of HUB Participation Form listing all HUB contractors, vendors and suppliers that will be used. If there is no HUB 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 by the Designer, as agent for the Owner, the certified check, cash or bid bond accompanying this bid shall be paid into the funds of the Owner's account set aside for the project, as liquidated damages for such failure; otherwise the certified check, cash or bid bond accompanying this proposal shall be returned to the undersigned.

Respectfully submitted this day of _____

(Name of firm or corporation making bid)

WITNESS:

By: _____
Signature

(Proprietorship or Partnership)

Name: _____
Print or type

Title _____
(Owner / Partner / President / Vice President)

Address _____

ATTEST:

By: _____

License No. _____

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

Federal I.D. No. _____

(CORPORATE SEAL)

Addendum received and used in computing bid:

Addendum No. 1 _____ Addendum No. 3 _____ Addendum No. 5 _____ Addendum No. 6 _____

Addendum No. 2 _____ Addendum No. 4 _____ Addendum No. 6 _____ Addendum No. 7 _____

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

In accordance with G.S. 143-128.2 (effective January 1, 2002) these guidelines establish goals for minority participation in single-prime bidding, separate-prime bidding, construction manager at risk, and alternative contracting methods. The legislation provides that the Public Owner shall have a verifiable ten percent (10%) goal for participation by minority businesses in the total value of work for each project for which a contract or contracts are awarded. These requirements are published to accomplish that end.

SECTION A: INTENT

It is the intent of these guidelines that the Owner, as awarding authority for construction projects, and the contractors and subcontractors performing the construction contracts awarded shall cooperate and in good faith do all things legal, proper and reasonable to achieve the statutory goal of ten percent (10%) for participation by minority businesses in each construction project as mandated by GS 143-128.2. Nothing in these guidelines shall be construed to require contractors or awarding authorities to award contracts or subcontracts to or to make purchases of materials or equipment from minority-business contractors or minority-business subcontractors who do not submit the lowest responsible, responsive bid or bids.

SECTION B: DEFINITIONS

1. Minority - a person who is a citizen or lawful permanent resident of the United States and who is:
 - a. Black, that is, a person having origins in any of the black racial groups in Africa;
 - b. Hispanic, that is, a person of Spanish or Portuguese culture with origins in Mexico, South or Central America, or the Caribbean Islands, regardless of race;
 - c. Asian American, that is, a person having origins in any of the original peoples of the Far East, Southeast Asia and Asia, the Indian subcontinent, the Pacific Islands;
 - d. American Indian, that is, a person having origins in any of the original peoples of North America; or
 - e. Female
2. Minority Business - means a business:
 - a. In which at least fifty-one percent (51%) is owned by one or more minority persons, or in the case of a corporation, in which at least fifty-one percent (51%) of the stock is owned by one or more minority persons or socially and economically disadvantaged individuals; and
 - b. Of which the management and daily business operations are controlled by one or more of the minority persons or socially and economically disadvantaged individuals who own it.
3. Socially and economically disadvantaged individual - means the same as defined in 15 U.S.C. 637. "Socially disadvantaged individuals are those who have been subjected to racial or ethnic prejudice or cultural bias because of their identity as a member of a group without regard to their individual qualities". "Economically disadvantaged individuals are those socially disadvantaged individuals whose ability to compete in the free enterprise system has been impaired due to diminished capital and credit opportunities as compared to others in the same business area who are not socially disadvantaged".
4. Public Entity - means the Owner and all public subdivisions and local governmental units.
5. Owner - The public institution named in the contract.

6. Designer – Any person, firm, partnership, or corporation, which has contracted with the Owner to perform architectural or engineering work.
7. Bidder - Any person, firm, partnership, corporation, association, or joint venture seeking to be awarded a public contract or subcontract.
8. Contract - A mutually binding legal relationship or any modification thereof, obligating the seller to furnish equipment, materials or services, including construction, and obligating the buyer to pay for them.
9. Contractor - Any person, firm, partnership, corporation, association, or joint venture which has contracted with the State of North Carolina to perform construction work or repair.
10. Subcontractor - A firm under contract with the prime contractor or construction manager at risk for supplying materials or labor and materials and/or installation. The subcontractor may or may not provide materials in his subcontract.

SECTION C: RESPONSIBILITIES

1. Office for Historically Underutilized Businesses, Department of Administration (hereinafter referred to as HUB Office).

The HUB Office has established a program, which allows interested persons or businesses qualifying as a minority business under G.S. 143-128.2, to obtain certification in the State of North Carolina procurement system. The information provided by the minority businesses will be used by the HUB Office to:

- a. Identify those areas of work for which there are minority businesses, as requested.
- b. Make available to interested parties a list of prospective minority business contractors and subcontractors.
- c. Assist in the determination of technical assistance needed by minority business contractors.

In addition to being responsible for the certification/verification of minority businesses that want to participate in the State construction program, the HUB Office will:

- (1) Maintain a current list of minority businesses. The list shall include the areas of work in which each minority business is interested.
- (2) Inform minority businesses on how to identify and obtain contracting and subcontracting opportunities through the State and other public entities.
- (3) Inform minority businesses of the contracting and subcontracting process for public construction building projects.
- (4) Work with the North Carolina trade and professional organizations to improve the ability of minority businesses to compete in the State construction projects.
- (5) The HUB Office also oversees the minority business program by:
 - a. Monitoring compliance with the program requirements.
 - b. Assisting in the implementation of training and technical assistance programs.
 - c. Identifying and implementing outreach efforts to increase the utilization of minority businesses.
 - d. Reporting the results of minority business utilization to the Secretary of the Department of Administration, the Governor, and the General Assembly.

2. The Owner
The Owner will be responsible for the following:

- a. Reviewing the apparent low bidders' statutory compliance with the requirements listed in the proposal prior to award of contracts. The Owner reserves the right to reject any or all bids and to waive informalities.
 - b. Monitoring of contractors' compliance with minority business requirements in the contract documents during construction.
 - c. Providing statistical data and required reports to the HUB Office.
 - d. Resolving any protest and disputes arising after implementation of the plan.
3. Constituent Institutions of The State of North Carolina
Before awarding a contract, a constituent institution shall do the following:
- a. Implement the constituent institution HUB plan.
 - b. Attend the scheduled prebid conference.
 - c. At least 10 days prior to the scheduled day of bid opening, notify minority businesses that have requested notices from the public entity for public construction or repair work and minority businesses that otherwise indicated to the Office for Historically Underutilized Businesses an interest in the type of work being bid or the potential contracting opportunities listed in the proposal. The notification shall include the following:
 1. A description of the work for which the bid is being solicited.
 2. The date, time, and location where bids are to be submitted.
 3. The name of the individual within the owner's organization who will be available to answer questions about the project.
 4. Where bid documents may be reviewed.
 5. Any special requirements that may exist.
 - d. Utilize other media, as appropriate, likely to inform potential minority businesses of the bid being sought.
 - e. Maintain documentation of any contacts, correspondence, or conversation with minority business firms made in an attempt to meet the goals.
 - f. Review, jointly with the designer, all requirements of G.S. 143-128.2(c) and G.S. 143-128.2(f) – (i.e. bidders' proposals for identification of the minority businesses that will be utilized with corresponding total dollar value of the bid and affidavit listing good faith efforts, or affidavit of self-performance of work, if the contractor will perform work under contract by its own workforce) - prior to recommendation of award.
 - g. Evaluate documentation to determine good faith effort has been achieved for minority business utilization prior to recommendation of award.
 - h. Review prime contractors' pay applications for compliance with minority business utilization commitments prior to payment.
 - i. Document evidence of implementation of Owner's responsibilities.
4. Designer
Under the single-prime bidding, separate prime bidding, construction manager at risk, or alternative contracting method, the designer will:
- a. Attend the scheduled prebid conference to explain minority business requirements to the prospective bidders.
 - b. Assist the owner to identify and notify prospective minority business prime and subcontractors of potential contracting opportunities.
 - c. Maintain documentation of any contacts, correspondence, or conversation with minority business firms made in an attempt to meet the goals.
 - d. Review jointly with the owner, all requirements of G.S. 143-128.2(c) and G.S.143-128.2(f) – (i.e. bidders' proposals for identification of the minority businesses that will be utilized with corresponding total dollar value of the bid and affidavit listing Good Faith Efforts, or affidavit of self-performance of work, if the contractor will perform work under contract by its own workforce) - prior to recommendation of award.

- e. During construction phase of the project, review “MBE Documentation for Contract Payment” – (Appendix E) for compliance with minority business utilization commitments. Submit Appendix E form with monthly pay applications to the owner and forward copies to the Owner.
- f. Make documentation showing evidence of implementation of Designer’s responsibilities available for review by the Owner and HUB Office, upon request.

5. Prime Contractor(s), CM at Risk, and Its First-Tier Subcontractors

Under the single-prime bidding, the separate-prime bidding, construction manager at risk and alternative contracting methods, contractor(s) will:

- a. Attend the scheduled prebid conference.
- b. Identify or determine those work areas of a subcontract where minority businesses may have an interest in performing subcontract work.
- c. At least ten (10) days prior to the scheduled day of bid opening, notify minority businesses of potential subcontracting opportunities listed in the proposal. The notification will include the following:
 - (1) A description of the work for which the subbid is being solicited.
 - (2) The date, time and location where subbids are to be submitted.
 - (3) The name of the individual within the company who will be available to answer questions about the project.
 - (4) Where bid documents may be reviewed.
 - (5) Any special requirements that may exist, such as insurance, licenses, bonds and financial arrangements.

If there are more than three (3) minority businesses in the general locality of the project who offer similar contracting or subcontracting services in the specific trade, the contractor(s) shall notify three (3), but may contact more, if the contractor(s) so desires.

- d. During the bidding process, comply with the contractor(s) requirements listed in the proposal for minority participation.
- e. Identify on the bid, the minority businesses that will be utilized on the project with corresponding total dollar value of the bid and affidavit listing good faith efforts as required by G.S. 143-128.2(c) and G.S. 143-128.2(f).
- f. Make documentation showing evidence of implementation of PM, CM-at-Risk and First-Tier Subcontractor responsibilities available for review by the constituent institution and HUB Office, upon request.
- g. Upon being named the apparent low bidder, the Bidder shall provide one of the following: (1) an affidavit (Affidavit C) that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the applicable goal; (2) if the percentage is not equal to the applicable goal, then documentation of all good faith efforts taken to meet the goal. Failure to comply with these requirements is grounds for rejection of the bid and award to the next lowest responsible and responsive bidder.
- h. The contractor(s) shall identify the name(s) of minority business subcontractor(s) and corresponding dollar amount of work on the schedule of values. The schedule of values shall be provided as required in Article 31 of the General Conditions of the Contract to facilitate payments to the subcontractors.
- i. The contractor(s) shall submit with each monthly pay request(s) and final payment(s), “MBE Documentation for Contract Payment” – (Appendix E), for designer’s review.
- j. During the construction of a project, at any time, if it becomes necessary to replace a minority business subcontractor, immediately advise the Owner, and the Director of the HUB Office in writing, of the circumstances involved. The prime contractor shall make a good faith effort to replace a minority business subcontractor with another minority business subcontractor.
- k. If during the construction of a project additional subcontracting opportunities become available, make a good faith effort to solicit subbids from minority businesses.
- l. It is the intent of these requirements apply to all contractors performing as prime contractor and first tier subcontractor under construction manager at risk on state projects.

6. Minority Business Responsibilities

While minority businesses are not required to become certified in order to participate in the State construction projects, it is recommended that they become certified and should take advantage of the appropriate technical assistance that is made available. In addition, minority businesses who are contacted by owners or bidders must respond promptly whether or not they wish to submit a bid.

SECTION D: DISPUTE PROCEDURES

It is the policy of this state that disputes that involves a person's rights, duties or privileges, should be settled through informal procedures. To that end, minority business disputes arising under these guidelines should be resolved as governed under G.S. 143-128(g).

SECTION E: These guidelines shall apply upon promulgation on University construction projects.

Copies of these guidelines may be obtained from:

<http://www.NorthCarolina.edu/finance/projects/projects.cfm#attachments>

SECTION F: In addition to these guidelines, there will be issued with each construction bid package provisions for contractual compliance providing MBE participation in State building projects. An explanation of the process follows, titled “MINORITY BUSINESS CONTRACT PROVISIONS (CONSTRUCTION)” along with relevant forms for its implementation (“Identification of Minority Business Participation” form, Affidavits A, B, C, D and Appendix E).

MINORITY BUSINESS CONTRACT PROVISIONS (CONSTRUCTION)

APPLICATION:

The **Guidelines for Recruitment and Selection of Minority Businesses for Participation in State Construction Contracts** are hereby made a part of these contract documents. These guidelines shall apply to all contractors regardless of ownership. Copies of these guidelines may be obtained from: <http://www.NorthCarolina.edu/finance/projects/projects.cfm#attachments>

MINORITY BUSINESS SUBCONTRACT GOALS:

The goals for participation by minority firms as subcontractors on this project have been set at 10%.

The bidder must identify on its bid, the minority businesses that will be utilized on the project with corresponding total dollar value of the bid and affidavit (Affidavit A) listing good faith efforts **or** affidavit (Affidavit B) of self-performance of work, if the bidder will perform work under contract by its own workforce, as required by G.S. 143-128.2(c) and G.S. 143-128.2(f).

The lowest responsible, responsive bidder must provide Affidavit C, that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the applicable goal.

OR

Provide Affidavit 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, **with documentation of Good Faith Effort, if the percentage is not equal to the applicable goal.**

OR

Provide Affidavit B, which includes sufficient information for the State to determine that the bidder does not customarily subcontract work on this type project.

The above information must be provided as required. Failure to submit these documents is grounds for rejection of the bid.

MINIMUM COMPLIANCE REQUIREMENTS:

All written statements, affidavits or intentions made by the Bidder shall become a part of the agreement between the Contractor and the Owner for performance of this contract. Failure to comply with any of these statements, affidavits, or intentions, or with the minority business Guidelines shall constitute a breach of the contract. A finding by the Owner that any information submitted either prior to award of the contract or during the performance of the contract is inaccurate, false or incomplete, shall also constitute a breach of the contract. Any such breach may result in termination of the contract in accordance with the termination provisions contained in the contract. It shall be solely at the option of the Owner whether to terminate the contract for breach.

In determining whether a contractor has made Good Faith Efforts, the Owner will evaluate all efforts made by the Contractor and will determine compliance in regard to quantity, intensity, and results of these efforts. Good Faith Efforts include:

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

AFFIDAVIT A – Listing of the Good Faith Effort

County of _____

Affidavit of _____

(Bidder)

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

(A minimum of 5 areas must be checked in order to have achieved a "good faith effort")

- 1 - 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 - 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 - Broken down or combined elements of work into economically feasible units to facilitate minority participation.
- 4 - 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 - Attended prebid meetings scheduled by the public owner.
- 6 - Provided assistance in getting required bonding or insurance or provided alternatives to bonding or insurance for subcontractors.
- 7 - 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 - 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 - 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 - Provided quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

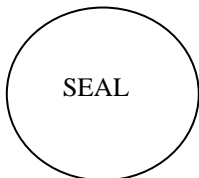
In accordance with GS143-128.2(d) the undersigned will enter into a formal agreement with the firms Listed, in the Identification of Minority Business Participation schedule conditional upon execution of a contract with the Owner. Failure to abide by this statutory provision will constitute a breach 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: _____



State of North Carolina, County of _____

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

Notary Public _____

My commission expires _____

AFFIDAVIT B – Intent to Perform Contract with Own 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

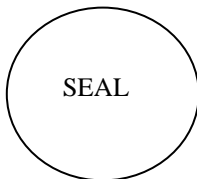
The Bidder agrees to provide any additional information or documentation requested by the owner in support of the above statement.

The 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: _____



State of North Carolina, County of _____

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

Notary Public _____

My commission expires _____

AFFIDAVIT C - Portion of the Work to be Performed by Minority Firms

Project _____

*******(NOTE: THIS FORM IS NOT TO BE SUBMITTED WITH THE BID PROPOSAL)*******

If the portion of the work to be executed by minority businesses as defined in GS143-128.2(g) is equal to or greater than 10% of the 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
(Bidder)

_____ (Project Name)

Amount of Bid \$ _____

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

Attach additional sheets if required.

Name and Phone Number	*Minority Category	Work description	Dollar Value

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

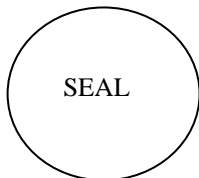
Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

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

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____



State of North Carolina, County of _____
 Subscribed and sworn to before me this _____ day of _____ 20____
 Notary Public _____
 My commission expires _____

AFFIDAVIT D – Good Faith Efforts

Project _____

If the goal of 10% participation by minority business **is not** achieved, the Bidder shall provide the following documentation to the Owner of his good faith efforts

(Bidder

Affidavit of: _____)

I do certify the attached documentation as true and accurate representation of my good faith efforts.

(Attach additional sheets if required)

Name and Phone Number	*Minority Category	Work description	Dollar Value

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

Documentation of the Bidder's good faith efforts to meet the goals set forth in these provisions.

Examples of documentation shall include the following evidence:

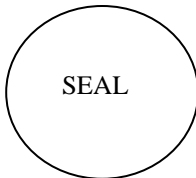
- A. Copies of solicitations for quotes to at least three (3) minority business firms from the source list provided by the State for each subcontract to be let under this contract (if 3 or more firms are shown on the source list). Each solicitation shall contain a specific description of the work to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

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

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____



State of North Carolina, 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 (List invoice number and 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****

SECTION C

OWNER-CONTRACTOR AGREEMENT

PROJECT NUMBER: ()

SCHOOL NAME: ()

THIS AGREEMENT, in four (4) copies, made this () day of _____, Two Thousand and Seventeen by and between Harnett County Schools (herein referred to as the "Owner"), whose mailing address is 1108 S. 11th Street, Lillington, NC 27546 and _____ - (herein referred to as the "Contractor"), whose mailing address is _____ correspondence, submittals, and notices relating to or required under this Contract shall be sent in writing to the above addresses; unless either party is notified in writing by the other, of a change in address.

WITNESSETH:

WHEREAS, it is the intent of the Owner to obtain the services of the Contractor in connection with the new construction of **a new dining room addition to Overhills High School, 2495 Ray Road, Spring Lake, NC 28390.**

hereinafter referred to as the "Project" or the "Work"; and

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

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

Article 1

DEFINITIONS

- 1.1 All terms in this Agreement which are defined in the Information for Bidders and the General Conditions shall have the meanings designated therein.
- 1.2 The Contract Documents are as defined in the General Conditions. Such documents form the Contract, and all are as fully a part thereof as if attached to this Agreement or repeated herein.

Article 2

STATEMENT OF THE WORK

- 2.1 The Project is the Work identified in the plans and specifications prepared by _____ dated _____, 2017 for Harnett County Schools, Overhills High School Dining Room Addition, including the following addenda:

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

- 2.3 The Parties agree to the following modifications to the Project's plans and specifications:

None

- 2.4 The Contractor shall provide and pay for all materials, tools, equipment, labor and professional and non-professional services, and shall perform all other acts and supply all other things necessary, to fully and properly perform and complete the Work, as required by the Contract Documents.
- 2.2 The Contractor shall further provide and pay for all related facilities described in any of the Contract Documents, including all work expressly specified therein and such additional work as may be reasonably inferred therefrom, saving and excepting only such items of work as are specifically stated in the Contract Documents not to be the obligation of the Contractor. The totality of the obligations imposed upon the contractor by this Article and by all other provisions of the Contract Documents, as well as the structures to be built and the labor to be performed, is herein referred to as the "Work".

Article 3

DESIGN CONSULTANT

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

Article 4

TIME OF COMMENCEMENT AND COMPLETION

Unit Price No. 2		\$
Unit Price No. 3		\$
Unit Price No. 4		\$
Unit Price No. 5		\$
Unit Price No. 6		\$
Unit Price No. 7		\$
Unit Price No. 8		\$

Article 6

PROGRESS PAYMENTS

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

Article 7

OTHER REQUIREMENTS

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

7.2 The Owner shall furnish to the Contractor () set(s) of drawings and () set(s) of specifications, at no extra cost, for use in the Construction of the Work. Additional sets of

drawings or specifications may be obtained by the Contractor by paying the Owner for the costs of reproduction, handling and mailing.

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

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

HARNETT COUNTY BOARD OF EDUCATION

_____(Seal)
Chair

_____(Seal)
Secretary

This contract was approved by the Board on the day of December, 2017.

(CONTRACTOR)

By: _____
President

ATTEST:

Corporate Secretary

[Corporate Seal]

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

Finance Officer Date

GO TO NEXT PAGE

SECTION V

GENERAL CONDITIONS

NOTICE OF DISCLAIMER

TAKE NOTICE, that these General Conditions may contain language and Article, Section or Paragraph headings or names which appear similar to or the same as the provisions of the "General Conditions of the Contract for Construction", published by the American Institute of Architects, AIA Document A-201.

TAKE NOTICE, however, that these General Conditions are substantially and materially different in many respects from the AIA Document A-201 and that certain additions, deletions or other modifications have been made to provisions similar to those contained in the AIA Document. This document, further, contains provisions, which do not appear in the AIA document.

The use of any language or Article or Paragraph format similar to or the same as AIA Document A-201 does not constitute an endorsement by the American Institute of Architects of this document.

SECTION V

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

TABLE OF ARTICLES

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| 1. CONTRACT DOCUMENTS | 9. PAYMENTS AND COMPLETION |
| 2. DESIGN CONSULTANT | 10. PROTECTION OF PERSONS AND
PROPERTY |
| 3. OWNER | 11. INSURANCE |
| 4. CONTRACTOR | 12. CHANGES IN THE WORK |
| 5. SUBCONTRACTORS | 13. UNCOVERING AND CORRECTION |
| 6. WORK BY OWNER OR BY
SEPARATE CONTRACTORS | 14. TERMINATION OF THE CONTRACT |
| 7. MISCELLANEOUS PROVISIONS | 15. DISPUTE RESOLUTION |
| 8. TIME | |

ARTICLE 1

CONTRACT DOCUMENTS

1.1 DEFINITIONS

1.1.1 AS SHOWN, AS INDICATED, AS DETAILED: These words, and words of like implication, refer to information contained in Drawings and Specifications describing the Work, unless explicitly stated otherwise in the Contract Documents.

1.1.2 CLAIM: A Claim as used in the Contract is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of contract terms, payment of money, a credit against the payment of money, extension of time or other relief with respect to the terms of the

Contract. The term Claim also includes other disputes and matters in question between the parties to a contract involved in the Owner's construction and repair projects arising out of or relating to the Contract or the construction process.

- 1.1.3 **CONTRACT:** The Contract is the sum of all the Contract Documents. The Contract represents the entire and integrated agreement between the Owner and the Contractor and supersedes all prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification as defined in Paragraph 1.1.4. The Contract may also be referred to in the Contract Documents as "this Contract", "this Agreement" or "the Agreement".
- 1.1.4 **CONTRACT DOCUMENTS:** The Contract Documents consist of the Owner-Contractor Agreement, the Conditions of the Contract (General and Supplemental Conditions), the Plans, Drawings, and Specifications, and all Addenda thereto issued prior to and all Modifications thereto issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties; (2) a Change Order or a Construction Change Directive issued pursuant to the provisions of Article 12; (3) a written interpretation issued by the Design Consultant pursuant to Paragraph 2.2.7; or (4) a written order for a minor Change in the Work issued pursuant to Section 12.4. The Contract Documents do not include any other documents including but not limited to soils, geotechnical or other reports, surveys and analysis, which may be printed, bound or assembled with the Contract Documents, or otherwise made available to the Contractor for review or information under this Contract, unless specifically enumerated and directly incorporated by reference in the Contract Documents.
- 1.1.5 **HE/HIS:** The term He or His is not intended to be gender specific.
- 1.1.6 **MANUFACTURER:** An individual, company, or corporation who manufactures, fabricates, or assembles a standard product. A standard product is one that is not made to special design, and if furnished by either direct sale or by contract to the Contractor, Subcontractor or Vendor.
- 1.1.7 **MATERIAL SUPPLIER OR VENDOR:** A person or organization who supplies, but who is not responsible for the installation of, materials, products and equipment.
- 1.1.8 **NOTICE:** The term Notice as used herein shall mean and include written notice. Notice shall be deemed to have been given when delivered to the address of the person, firm or corporation for whom intended, or to his, their or its duly authorized agent, representative or officer; or when enclosed in a postage prepaid wrapper or envelope addressed to such person, firm or corporation at his, their or its Notice Address and deposited in a United States mailbox by registered or certified mail. To "Notify" means to give Notice. The Notice Addresses for the Owner and Contractor are stated in the Owner-Contractor Agreement and may be changed by a party by giving Notice to the other of such change.
- 1.1.9 **PLANS OR DRAWINGS:** All drawings or reproduction of drawings pertaining to the Work.
- 1.1.10 **PRODUCT:** The term Product includes materials, systems and equipment.
- 1.1.11 **PROJECT:** The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part.
- 1.1.12 **PROPOSAL:** A complete and properly signed document whereby the Contractor proposes to provide additional or a reduced scope of construction work on the Project for the sums stipulated therein, supported by data required by the Design Consultant or Owner.

- 1.1.13 PROVIDE: As a directive to the Contractor, and as pertaining to labor, materials or equipment, "provide" means "furnish and install completely".
- 1.1.14 SPECIFICATIONS: Descriptions, provisions and requirements, pertaining to method and manner of performing the Work, or to quantities and qualities of materials or equipment to be furnished under terms of the Contract.
- 1.1.15 WORK: The Work comprises the construction and services required of the Contractor by the Contract Documents and includes all labor, supplies and other facilities or things necessary to produce such construction, and all materials, equipment, and supplies incorporated or to be incorporated in such construction.
- 1.2 EXECUTION, CORRELATION AND INTENT
- 1.2.1 The Contractor and Owner acknowledge that neither these General Conditions, nor any other Contract Document shall be construed against the Owner due to the fact that they may have been drafted by the Owner or the Owner's agent. For the purposes of construing these General Conditions, and any other Contract Document, both the Contractor and the Owner shall be considered to have jointly drafted them.
- 1.2.2 The Owner-Contractor Agreement shall be signed in not less than three (3) copies by the Owner and Contractor, and each of which shall be deemed an original, but all of which shall constitute one and the same instrument.
- 1.2.3 By executing the Contract, the Contractor represents that he has visited the site, familiarized himself with the local conditions under which the Work is to be performed, and correlated his observations with the requirements of the Contract Documents.
- 1.2.4 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work. The Contract Documents are complementary, and what is required by any one shall be as binding as if required by all. Performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended results. Words and abbreviations which have well-known technical or trade meanings are used in the Contract Documents in accordance with such recognized meanings unless otherwise specifically defined herein. The table of contents, titles, headings, running headlines and marginal notes contained herein and in said documents are solely to facilitate reference to various provisions of the Contract Documents and in no way affect, limit or cast light upon the interpretation of the provisions to which they refer.
- 1.2.5 The organization of the Specifications into divisions, sections and articles, and the arrangement of Drawings are for convenience only. The Contractor may subcontract the Work in such divisions as he sees fit consistent with applicable law and he is ultimately responsible for furnishing all of the Work.
- 1.2.6 Anything shown on the Drawings and not mentioned in the Specifications or mentioned in the Specifications and not shown on the Drawings shall have the same effect as if shown or mentioned respectively in both. Detailed specifications take priority over general specifications and detailed drawings take precedence over general drawings. Any Work shown on one drawing shall be construed to be shown in all drawings. If any portion of the Contract Documents shall be in conflict with any other portion, the various documents comprising the

Contract Documents shall govern in the following order of precedence: The Owner-Contractor Agreement; the Supplemental Conditions; the General Conditions; the Specifications; the Drawings. The Contractor shall notify the Design Consultant and the Owner of all such inconsistencies promptly. Any such conflict or inconsistency between or in the Drawings or Specifications shall be submitted by the Contractor promptly to the Owner and Design Consultant and the Design Consultant's decision thereon shall be final and conclusive.

1.2.7 The Contractor agrees that nothing contained in the Contract Documents or any contract between the Owner and the Design Consultant shall create any contractual relationship between the Design Consultant and the Contractor, or between the Design Consultant and any Subcontractor or Sub-subcontractors. The Contractor acknowledges and agrees that this Contract is not intended to create, nor shall any provision be interpreted as creating, any contractual relationship between the Owner or Contractor and any third parties.

1.2.8 The provisions of this Contract cannot be amended, modified, varied or waived in any respect except by a Modification. The Contractor is hereby given notice that no person has authority to orally waive, or to release the Contractor from any of the Contractor's duties or obligations under or arising out of this Contract. Any waiver, approval or consent granted by Modification to the Contractor shall be limited to those matters specifically and expressly stated thereby to be waived, approved or consented to and shall not relieve the Contractor of the obligation to obtain any future waiver, approval or consent.

1.2.9 Any material or operation specified by reference to published specifications of a Manufacturer, a society, an association, a code, or other published standard, shall comply with requirements of the listed document which is current on date the Owner received bids for the construction of the Project. In case of a conflict between referenced document and the Specifications, Specifications shall govern. In case of a conflict between such listed documents, the one having more stringent requirements shall govern.

1.2.10 The Contractor, if requested, shall furnish an affidavit from each or any Manufacturer certifying that materials or products delivered to the job meets requirements specified.

1.3 OWNERSHIP AND USE OF DOCUMENTS

1.3.1 All Drawings, Specifications and copies thereof furnished by the Design Consultant are and shall remain the property of the Owner. They are to be used by Contractor only with respect to the Project and are not to be used by Contractor on any other project. With the exception of one contract set for each party to the Contract, such documents are to be returned or suitably accounted for to the Owner on request at the completion of the Work. Submission or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of Owner's rights or the Design Consultant's common law copyright or other reserved rights.

ARTICLE 2

THE DESIGN CONSULTANT

2.1 DEFINITIONS

2.1.1 The term "Design Consultant" or "A/E" or "Architect" or "Engineer" as used or set forth in the Contract Documents, shall mean the entity and its consultants or agents, or their duly authorized representatives, that is responsible for designing or engineering the Work, and performing the activities specified herein, and in the Agreement for Design Consultant Services, including any consultants to said entity or firm acting within the scope of their agreements with the Design Consultant. Such firm or agency and its representatives shall act severally within the scope of particular duties entrusted to them, unless otherwise provided for in the Contract Documents or in the Agreement for Design Consultant Services.

2.1.2 The Design Consultant may be identified in the Owner-Contractor Agreement and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The Design Consultant is further described as and, throughout this document, shall mean one or both of the following:

2.1.2.1 ARCHITECT, a person or other legal entity lawfully licensed to practice architecture in the State wherein the Project is located; or

2.1.2.2 ENGINEER, a person or other legal entity lawfully licensed to practice engineering in the State wherein the Project is located.

2.2 SERVICES OF THE DESIGN CONSULTANT

2.2.1 The Design Consultant will provide certain services as hereinafter described and further described in the Agreement for Design Consultant Services.

2.2.2 Should errors, omissions, or conflicts in the Drawings, Specifications, or other Contract Documents prepared by or on behalf of the Design Consultant be discovered, the Design Consultant will prepare such amendments or supplementary documents and provide consultation as may be required.

2.2.3 The Design Consultant will visit the site at intervals appropriate to the stage of construction to familiarize itself generally with the progress and quality of the Work and to determine in general if the Work is proceeding in accordance with the Contract Documents. The Design Consultant will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work, but it shall make as many inspections as may reasonably be required to fulfill its obligations to the Owner. On the basis of such on-site observations, the Design Consultant and his consultants shall endeavour to guard the Owner against defects and deficiencies in the Work. The Design Consultant will conduct the weekly construction meeting and shall be responsible for preparing accurate and complete minutes of all such meetings and other Project meetings and distributing same to all participants.

2.2.4 The Design Consultant will render written field reports to the Owner in the form required by the Owner relating to the periodic visits and inspections of the Project required by Paragraph 2.2.3.

- 2.2.5 The Design Consultant will not be responsible for and will not have control or charge of construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, and he will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The Design Consultant will not be responsible for or have control or charge over the acts or omissions of the Contractor, Subcontractors, or any of their agents or employees, or any other persons performing any portion of the Work.
- 2.2.6 The Design Consultant shall at all times have access to the Work wherever it is in preparation or progress. The Contractor shall provide safe facilities for such access so the Design Consultant may perform his functions under the Contract Documents.
- 2.2.7 As required, the Design Consultant will render to the Owner, within a reasonable time, interpretations concerning the design and other technical aspects of the Work and the Contract Documents.
- 2.2.8 All communications, correspondence, submittals, and documents exchanged between the Design Consultant and the Contractor in connection with the Project shall be through the Owner or in the manner prescribed by the Owner. Further, all communications, correspondence, submittals and documents transmitted from the Owner or Design Consultant will be directed to the Contractor and copied to the Owner or Design Consultant.
- 2.2.9 All interpretations and decisions of the Design Consultant shall be consistent with the intent of and reasonably inferable from the Contract Documents.
- 2.2.10 The Design Consultant's decisions in matters relating to artistic effect will be final if consistent with the intent of the Contract Documents.
- 2.2.11 If the Design Consultant observes any Work that does not conform to the Contract Documents, the Design Consultant shall report this observation to the Owner. The Design Consultant will prepare and submit to the Owner "punch lists" of the Contractor's work, which is not in conformance with the Contract Documents. The Owner will transmit such "punch lists" to the Contractor.
- 2.2.12 The Design Consultant has the authority to condemn or reject any or all of the Work on behalf of the Owner when, in its opinion, the Work does not conform to the Contract Documents. Whenever, in the Design Consultant's reasonable opinion, it is considered necessary or advisable for the implementation of the intent of the Contract Documents, the Design Consultant will have the authority to require special inspection or testing of any portion of the Work in accordance with the provisions of the Contract Documents whether or not such portion of the Work be then fabricated, installed or completed.
- 2.2.13 The Design Consultant will review the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for conformance with the design concept of the Work and for general compliance with the Contract Documents. Such action shall be taken within fourteen (14) days of receipt unless otherwise authorized by the Owner.
- 2.2.14 The Owner will establish with the Design Consultant procedures to be followed for review and processing of all Shop Drawings, catalogue submittals, project reports, test reports, maintenance manuals, and other necessary documentation, as well as requests for changes and applications for extensions of time.

- 2.2.15 The Design Consultant will prepare Change Orders and Construction Change Directives when requested by the Owner.
- 2.2.16 The Design Consultant and the Owner will conduct inspections to determine the dates of Substantial Completion and Final Completion. The Design Consultant will issue a final Certification of Payment.
- 2.2.17 The Design Consultant will prepare three (3) printed copies and one (1) electronic computer file compatible with the latest version of AutoCAD, or other program designated by Owner, showing significant Changes in the Work made during the construction process, based on neatly and clearly marked-up Drawings, prints, and other data furnished by the Contractor(s) and the applicable Addenda, clarifications and Change Orders which occurred during the Project. The Design Consultant will also provide the Owner assistance in the original operation of any equipment or system such as initial start-up, testing, adjusting, and balancing.
- 2.2.18 In case of the termination of the employment of the Design Consultant, the Owner may appoint a Design Consultant whose status under the Contract Documents shall be that of the former Design Consultant.

ARTICLE 3

OWNER

3.1 DEFINITION

3.1.1 The Owner is the person or entity identified as such in the Owner-Contractor Agreement and may be referred to throughout the Contract Documents as if singular in number and masculine in gender. The term Owner means the Owner or his authorized representative or agent. The phrase "Owner or its agent" as used in this Agreement, does not include the Separate Contractors or their Subcontractors.

3.1.2 Owner: Harnett County Board of Education
1008 S. 11th Street
Lillington, North Carolina, 27546

3.2 INFORMATION, SERVICES AND RIGHTS OF THE OWNER

3.2.1 The Owner will provide administration of the Contract as herein described. The Design Consultant shall also provide aspects of administration of the Contract as herein described or as specified in the Agreement for Design Consultant Services.

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

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

3.2.4 The Owner will have authority to require special inspection or testing of portions of the Work to the same extent as the Design Consultant in accordance with Paragraph 2.2.12 whether or not

such portion of the Work be then fabricated, installed, or completed. However, neither the Owner's authority to act under Paragraph 3.2.4, nor any decision made by the Owner in good faith either to exercise or not to exercise such authority shall give rise to any duty or responsibility of the Owner to the Contractor, any Subcontractor, any of their agents or employees, or any other person performing any of the Work.

- 3.2.5 The Owner shall have the authority and discretion to call, schedule, and conduct job meetings to be attended by the Contractor, representatives of his Subcontractors, and the Design Consultant, to discuss such matters as procedures, progress, problems, and scheduling.
- 3.2.5.1 The Contractor is requested and required to attend weekly job site progress conferences as called by the Design Consultant. The Contractor shall be represented at these job progress conferences by an authoritative representative of the home office of the Contractor as well as by project personnel representatives. These meetings shall be open to Subcontractors, Material Suppliers, and any others who can contribute shall be encouraged by the Contractor to attend. It shall be the principal purpose of these meetings, or conferences, to affect 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. The Contractor shall be prepared to assist progress of the Work as required in his particular contract and to recommend remedial measures for the correction of progress as may be appropriate. The Design Consultant shall be the coordinator of the conferences and shall preside as chairman.
- 3.2.5.2 If the Project is awarded as a single prime construction contract, the Design Consultant shall determine which, if any, Subcontractors and/or Material Suppliers shall be required to attend weekly job site progress conferences. The Contractor shall comply with this request and the meeting shall be conducted as described in Subparagraph 3.2.5.1.
- 3.2.6 The Owner will establish procedures to be followed for processing all Shop Drawings, catalogues, and other project reports, and other documentation, test reports, and maintenance manuals.
- 3.2.7 The Owner and Design Consultant will review all requests for changes and shall implement the processing of Change Orders, including applications for extension of the Contract Time.
- 3.2.8 The Owner, will not be responsible for the failure of the Contractor to plan, schedule, and execute the Work in accordance with the approved schedule or the failure of the Contractor to meet scheduled Completion Dates or the failure of the Contractor to schedule and coordinate the Work of his own trades and Subcontractors or to coordinate and cooperate with any Separate Contractors.
- 3.2.9 The Owner, in consultation with the Design Consultant, will review and process all Applications for Payment by the Contractor, including the final Application for Payment.
- 3.2.10 The Owner and Design Consultant shall not be responsible or liable to Contractor for the acts, errors or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons performing any of the Work or working on the Project.
- 3.2.11 The Owner shall furnish surveys describing the physical characteristics and legal limitations for the site of the Project, which are in its possession and are relevant to the Work.

- 3.2.12 The Owner shall secure and pay for necessary easements, required for permanent structures or for permanent changes in existing facilities.
- 3.2.13 The Owner shall furnish information or services under the Owner's control with reasonable promptness to avoid unreasonable delay in the orderly progress of the Work.
- 3.2.14 Unless otherwise provided in the Contract Documents, the Contractor will be furnished, free of charge, copies of Drawings and Specifications in accordance with the Supplemental Conditions.
- 3.2.15 The Owner will make reasonable efforts to make available for the Contractor's reasonable review, at the Owner's offices or together with the Contract Documents, certain boring logs, geotechnical, soils and other reports, surveys and analyses pertaining to the Project site of which the Owner is aware, has in its possession and are relevant to the Work. Any boring logs that are provided to the Contractor are only intended to reflect conditions at the locations of the borings and do not necessarily reflect site conditions at other locations. Any reports, surveys and analyses provided by Owner are for the Contractor's information only, and their accuracy and completeness are not guaranteed or warranted by the Owner or the Design Consultant, and such reports are not adopted by reference into, nor are they part of the Contract Documents. Notwithstanding any factual statement, conclusion, or any language or recommendations contained in such reports, the Contractor assumes full responsibility for inspection of the site and determination of the character, quality and quantity of any soil, surface or subsurface conditions that may be encountered or which may affect the Work, and for the means and methods of construction that he employs when performing the Work.
- 3.2.16 The foregoing rights are in addition to other rights of the Owner enumerated herein and those provided by law.

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

- 3.3.1 If the Contractor fails to correct defective Work as required by Section 13.2 or fails to carry out the Work or supply labor and materials in accordance with the Contract Documents, the Owner by a written Notice may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of the Owner to stop the Work shall not give rise to any duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity.
- 3.3.2 The Owner may order the Contractor in writing to suspend, delay, or interrupt all or any part of the Work for such period of time as he may determine to be appropriate for the convenience of the Owner.
- 3.3.3 If the performance of all or any part of the Work (including the work of the Contractor and its Subcontractors) is, for an unreasonable period of time, suspended, delayed, or interrupted by an act of the Owner or the Design Consultant, or by failure of any one of them to act within the time specified in this Contract (or if no time is specified, within a reasonable time), an adjustment shall be made for an increase in the actual time required for performance of the Work by the Contractor, due solely to such unreasonable suspension, delay, or interruption and the Contract modified in writing accordingly. However, no Claim shall be made under this Paragraph for any suspension, delay, or interruption pursuant to Paragraph 3.4.1, or for which Claim is provided or excluded under any other provision of this Contract. No Claim under this Paragraph shall be allowed on behalf of the Contractor or its Subcontractors, unless within twenty (20) days after the act or failure to act involved, and for continuing or ongoing acts or

failures to act within twenty (20) days of the first day of the act or failure to act, the Contractor submits to the Owner a written statement setting forth, as fully as then practicable, the extent of such Claim, and unless the Claim is asserted in writing within thirty (30) days after the termination of such suspension, delay, or interruption. For continuing or ongoing acts or failures to act, the Contractor shall update its written statement every twenty (20) days until the suspension, delay or interruption is terminated. The Contractor shall waive any and all Claims under this Paragraph 3.3.3 which are not filed in strict conformance with Paragraph 3.3.3. The Contractor shall indemnify, defend and hold the Owner harmless from any Claim by a Subcontractor that is waived because it is not filed in strict conformance with this Paragraph 3.3.3 or any other provision of the Contract regarding Claims.

- 3.3.4 In the event of a suspension of the Work or delay or interruption of the Work per Paragraph 3.3.3, the Contractor will and will cause his Subcontractors to protect carefully his, and their, materials and Work against damage, loss or injury from the weather and maintain completed and uncompleted portions of the Work as required by the Contract Documents. If, in the opinion of the Owner, any Work or material shall have been damaged or injured by reason of failure on the part of the Contractor or any of his Subcontractors to so protect same, such Work and materials shall be removed and replaced at the expense of the Contractor.
- 3.3.5 No Claim by the Contractor under Paragraph 3.3.3 shall be allowed if asserted after final payment under this Contract or if it is not asserted in strict conformance with Paragraph 3.3.3.

3.4 OWNER'S RIGHT TO CARRY OUT THE WORK

- 3.4.1 If the Contractor defaults or otherwise neglects to carry out the Work in accordance with the Contract Documents and fails within ten (10) days after the date written Notice is given by the Owner, with a copy of such Notice sent to the Contractor's Surety, to commence and continue remedy of such default or neglect with diligence and promptness, the Owner may, without prejudice to any other remedy he may have, make good such deficiencies and may further elect to complete all Work thereafter through such means as the Owner may select, including the use of a new contractor pursuant to Paragraph 3.4.2. In such case, the Owner shall provide Notice to the Contractor's Surety and an appropriate Change Order shall be issued deducting from the payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for the Design Consultant's additional services made necessary by such default, neglect or failure and any other damages suffered by Owner as a result of Contractor's breach, including but not limited to Owner's reasonable attorney's fees and litigation costs and expenses. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor or its Surety shall pay the difference to the Owner. Notwithstanding the Owner's right to carry out a portion of the Work, warranty, maintenance and protection of the Work remains the Contractor's and Surety's responsibility. Further, the provisions of this Paragraph do not affect the Owner's right to require the correction of defective or non-conforming Work in accordance with Section 13.2.
- 3.4.2 Whenever the Contractor shall be, and declared by the Owner to be in default under the Contract, the Owner having substantially performed Owner's obligations thereunder, the Surety shall promptly remedy the default, or shall be liable to Owner for damages pursuant to the Performance Bond and as provided by law. Any action by Surety or by Owner against the Surety shall not relieve Contractor of its duties, responsibilities and liabilities to Owner pursuant to the Contract or as allowed by law.

ARTICLE 4

CONTRACTOR

4.1 DEFINITION

4.1.1 The Contractor is the person or organization identified as such in the Owner-Contractor Agreement and may be referred to throughout the Contract Documents as if singular in number and masculine in gender. The term Contractor means the Contractor or his authorized representative, who shall have authority to bind the Contractor in all matters pertinent to the Contract.

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

4.2 REVIEW OF CONTRACT DOCUMENTS

4.2.1 The Contractor represents that prior to executing this Contract, the Contractor carefully reviewed and studied the Contract Documents and notified the Owner and Design Consultant of any errors, inconsistencies or omissions of which the Contractor is aware. The Contractor agrees to continuously and carefully study and compare the Contract Documents after the execution of this Contract and shall at once report to the Owner and Design Consultant any error, inconsistency or omission he may discover, including, but not limited to, any requirement which may be contrary to any law, ordinance, rule, regulation, building code, or order of any public authority bearing on the Work. If the Contractor has reported in writing an error, inconsistency or omission, has promptly stopped the affected Work until otherwise instructed, and has otherwise followed the instructions of the Owner, the Contractor shall not be liable to the Owner or the Design Consultant for any damage resulting from any such errors, inconsistencies or omissions in the Contract Documents. The Contractor shall perform no portion of the Work at any time without it being specified in Contract Documents and, where required, approved Shop Drawings, Product Data or Samples for such portion of the Work.

4.2.2 The Contractor and his Subcontractors shall keep at the site of the Work at least one copy of the Drawings and Specifications and shall at all times give the Owner, the Design Consultant, inspectors, as well as other representatives of the Owner access thereto.

4.3 SUPERVISION AND CONSTRUCTION PROCEDURES

4.3.1 The Contractor shall supervise and direct the Work, using his best skill and attention. He shall be solely responsible for and have control over all construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract.

4.3.1.1 It shall be the Contractor's responsibility to schedule the Work; to maintain a progress schedule for the Project; and to notify the Design Consultant and the Owner of any changes in the progress schedule. He shall be responsible for providing adequate notice to all Subcontractors to insure efficient continuity of all phases of the Project. The Contractor is responsible for keeping the Owner and Design Consultant fully informed as to the work progress, including immediate notification of any work progress changes.

4.3.2 The Contractor shall be responsible to the Owner for the acts and omissions of his employees,

Subcontractors and Sub-subcontractors, Suppliers, their agents and employees, and other persons performing any of the Work and for their compliance with each and every requirement of the Contract Documents, in the same manner as if they were directly contracted by the Contractor.

- 4.3.3 The Contractor shall not be relieved from his obligations to perform the Work in accordance with the Contract Documents either by the acts, failures to act or duties of the Owner or the Design Consultant in their administration of the Contract, or by inspections, tests or approvals (or the lack thereof) required or performed under Section 7.6 by persons other than the Contractor.
- 4.3.4 Before starting a section of the Work, the Contractor shall carefully examine all preparatory work that has been executed to receive his work to see that it has been completed in accordance with the Contract Documents. He shall check carefully, by whatever means are required, to ensure that his work and adjacent, related work will finish to proper and required standards for quality, contours, planes, and levels.
- 4.3.5 The Contractor understands and agrees that the Owner and Design Consultant will not be responsible for and will not have control or charge of construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, and they will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The Owner and the Design Consultant will not be responsible for or have control or charge over the acts or omissions of the Contractor, Subcontractors, or any of their agents or employees, or any other persons performing any of the Work.
- 4.3.6 The Contractor shall not use or provide Subcontractor equipment, materials, methods or persons to which Owner and Design Consultant have a reasonable objection and shall remove no portion of the Work or stored materials from the site of the Work, except for defective Work the Contractor may be required to replace or repair as set forth herein.
- 4.3.7 The Contractor shall verify all grades, lines, levels and dimensions as indicated and shown on the Drawings and in the Specifications prior to beginning any portion of the Work and shall immediately report in writing any errors or inconsistencies to the Design Consultant before commencing that portion of the Work.

4.4. CONTRACTOR'S REPRESENTATIONS

- 4.4.1 By entering into this Contract with the Owner, the Contractor represents and warrants the following, together with all other representations and warranties in the Contract Documents:
 - .1 That he is experienced in and competent to perform the type of work required and to furnish the Subcontractors, materials, supplies, equipment and services to be performed or furnished by him;
 - .2 That he is financially solvent, able to pay his debts as they mature, and possessed of sufficient working capital to initiate and complete the Work required under the Contract;
 - .3 That he is familiar with all Federal, State, County, municipal and department laws, ordinances, permits, regulations, building codes and resolutions which may in any way affect the Work or those employed therein, including but not limited to any special laws or regulations relating to the Work or any part thereof;

- .4 That such temporary and permanent Work required by the Contract Documents will be satisfactorily constructed and fit for use for its intended purpose and that such construction will not injure any person, or damage any property;
- .5 That he has carefully examined the Contract Documents and the site of the Work and that from his own investigations, he has satisfied himself and made himself familiar with: (1) the nature and location of the Work; (2) the character, quality and quantity of surface and subsurface materials likely to be encountered, including, but not limited to, all structures and obstructions on or at the Project site, both natural and man-made; (3) the character of equipment and other facilities needed for the performance of the Work; (4) the general and local conditions including without limitation its climatic conditions, the availability and cost of labor and the availability and cost of materials, tools and equipment; (5) the quality and quantity of all materials, supplies, tools, equipment, labor and professional services necessary to complete the Work in the manner required by the Contract Documents; and (6) all other matters or things which could in any manner affect the performance of the Work;
- .6 That he will fully comply with all requirements of the Contract Documents;
- .7 That he will perform the Work consistent with good workmanship, sound business practice, and in the most expeditious and economical manner consistent with the best interests of the Owner;
- .8 That he will furnish efficient business administration and experienced project management and supervision, and an adequate supply of workers, equipment, tools and materials at all times;
- .9 That he has carefully reviewed the Work required and that the Work can be planned and executed in a normal and orderly sequence of Work and reasonably scheduled so as to ensure completion of the Work in accordance with the Contract Documents, allowing for normal and reasonably foreseeable weather, labor and other delays, interruptions and disruptions of the Work;
- .10 That he will complete the Work within the Contract Time and all portions thereof within any required Completion Dates;
- .11 That his Contract Sum is based upon the labor, materials, systems and equipment required by the Contract Documents, without exception; and
- .12 That he will make a good faith effort to utilize Historically Underutilized Businesses (HUB's) per N.C. Gen. Stat. 143-128.2 and Section IV of the Project Manual, as Subcontractors for the Work.

4.5 LABOR AND MATERIALS

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

or to be incorporated in the Work. Final payment will not be made until the Work is so completed and Contractor has otherwise complied with the Contract Documents in full.

4.5.2 The Contractor shall at all times enforce strict discipline and good order among his employees and Subcontractors performing any of the Work and shall not employ or contract with on the Work any unfit person or entity or anyone not skilled in the task assigned to him. The Owner may, by Notice, require the Contractor to remove from the Work any employee or employee of a Subcontractor performing any of the Work, that the Owner deems incompetent, careless or otherwise objectionable.

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

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

4.6 WARRANTY

4.6.1 The Contractor warrants to the Owner and the Design Consultant that all materials and equipment furnished under this Contract will be new unless otherwise specified, and that all workmanship will be in accordance with generally accepted industry standards, free from faults and defects and in conformance with the Contract Documents and all other warranties and guaranties specified therein. Where no standard is specified for such workmanship or materials, they shall be the best of their respective kinds. All Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. If required by the Owner or the Design Consultant, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. This warranty is not limited by the provisions of Article 13.

4.6.2 The Contractor will be required to complete the Work specified and to provide all items needed for construction of the Project, complete and in good order.

4.6.3 The warranties set forth in this Section 4.6 and elsewhere in the Contract Documents shall survive Final Completion of the Work under Section 9.9.

4.6.4 The Contractor guarantees and warrants to the Owner all Work as follows:

- .1 That all materials and equipment furnished under this Contract will be new and the best of its respective kind unless otherwise specified;
- .2 That all Work will be in accordance with generally accepted industry standards and free of omissions and faulty, poor quality, imperfect and defective material or workmanship;
- .3 That the Work shall be entirely watertight and leak proof in accordance with all applicable

industry customs and practices, and shall be free of shrinkage and settlement;

- .4 That the Work, including but not limited to, mechanical and electrical machines, devices and equipment, shall be fit and fully usable for its intended and specified purpose and shall operate satisfactorily with ordinary care;
 - .5 That consistent with requirements of the Contract Documents, the Work shall be installed and oriented in such a manner as to facilitate unrestricted access for the operation and maintenance of fixed equipment;
 - .6 That the Work will be free of abnormal or unusual deterioration which occurs because of poor quality materials, workmanship or unsuitable storage; and
 - .7 That the products or materials incorporated in the Work will not contain asbestos.
- 4.6.5 All Work not conforming to guarantees and warranties specified in the Contract Documents, including substitutions not properly approved and authorized, may be considered defective. If required by the Design Consultant or Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.
- 4.6.5.1 The Contractor will submit a written affidavit certifying that none of the materials incorporated in the Project contain asbestos.
- 4.6.6 If, within one (1) year after the date of Substantial Completion of the Work or designated portion thereof as defined in Paragraph 8.1.3 or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be defective, not in accordance with the Contract Documents, or not in accordance with the guarantees and warranties specified in the Contract Documents, the Contractor shall correct it within five (5) working days or such other period as mutually agreed, after receipt of Notice from the Owner to do so. The Owner shall give such Notice with reasonable promptness after discovery of the condition. For items that remain incomplete or uncorrected on the date of Substantial Completion, the one (1) year warranty shall begin on the date of Final Completion of the Work or upon correction of the defective Work.
- 4.6.7 If at any time deficiencies in the Work are discovered which are found to have resulted from fraud or misrepresentation, or an intent or attempt to or conspiracy to defraud the Owner by the Contractor, any Subcontractor or Supplier, the Contractor will be liable for replacement or correction of such Work and any damages which Owner has incurred related thereto, regardless of the time limit of any guarantee or warranty.
- 4.6.8 Any materials or other portions of the Work, installed, furnished or stored on site which are not of the character or quality required by the Specifications, or are otherwise not acceptable to the Design Consultant or the Owner, shall be immediately removed and replaced by the Contractor to the satisfaction of the Design Consultant and Owner, when notified to do so by the Design Consultant or Owner.

- 4.6.9 If the Contractor fails to correct defective or non-conforming Work as required by Paragraph 4.6.6, or if the Contractor fails to remove defective or non-conforming Work from the site, as required by Paragraph 4.6.8, the Owner may elect to either correct such Work in accordance with Section 3.4 or remove and store materials and equipment at the expense of the Contractor. If the Contractor does not pay the cost of such removal and storage within ten (10) days thereafter, the Owner may upon ten (10) additional days written Notice sell such Work at auction or at private sale and shall account for the net proceeds thereof, after deducting all the costs that should have been borne by the Contractor, including compensation for the Design Consultant's additional services and Owner's reasonable attorney's fees made necessary thereby. If such proceeds of sale do not cover all costs, which the Contractor should have borne, the difference shall be charged to the Contractor and an appropriate Change Order shall be issued. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.
- 4.6.10 The Contractor shall bear the cost of making good all of the Work of the Owner, Separate Contractors or others, destroyed or damaged by such correction or removal required under this Article 4, Article 13 or elsewhere in the Contract Documents.
- 4.7 TAXES
- 4.7.1 The Contractor shall pay all sales, consumer, use and other similar taxes for the Work or portions thereof provided by the Contractor which are legally enacted at the time the Owner received bids for the construction of the Project, whether or not yet effective.
- 4.8 PERMITS, FEES AND NOTICES
- 4.8.1 The Owner shall be responsible for fees associated with permits and approval of the Drawings including but not limited to building permit, utility impact fees, stormwater permit and driveway permit.
- 4.8.2 The Contractor is responsible for all fees, permits and other costs associated with temporary utilities, including but not limited to installation, use, disconnection, removal and/or relocation.
- 4.8.3 The Contractor will pay for his own license, inspection and re-inspection fees for the proper execution and completion of the Work.
- 4.8.4 The Contractor shall give all notices and comply with all laws, ordinances, rules, regulations and lawful orders of any public authority bearing on the performance of the Work, including but not limited to all applicable building codes. If Contractor believes that any part of the Drawings or Specifications are inconsistent with applicable laws, rules, regulations, lawful orders of public authorities or building codes, Contractor shall Notify the Owner and Design Consultant of such inconsistencies immediately.
- 4.9 ALLOWANCES
- 4.9.1 The Contractor shall include in the Contract Sum all Allowances stated in the Contract Documents. Items covered by these Allowances shall be supplied for such amount and by such persons as the Owner may direct, but the Contractor will not be required to employ persons against whom he makes a reasonable objection.

4.9.2 Unless otherwise provided in the Contract Documents:

- .1 Allowances for Work: These allowances shall cover the cost to the Contractor for the materials and equipment required by the allowance delivered at the site, all applicable taxes, unloading, uncrating and storage, protection from elements, labor, installation and finishing and other expenses required to complete the installation, and a fixed percentage for overhead and profit as defined in Article 12.
- .2 Allowances for Products/Materials: Allowance includes the cost of the product, delivery to the site and applicable taxes. The Contractor's costs for unloading and handling on the site, labor, installation , overhead, profit and other expenses contemplated for the material allowance shall be included in the Contract Sum and not in the allowance;
- .3 Whenever the cost is more than or less than the Allowance, the Contract Sum shall be adjusted accordingly by Change Order, the amount of which will recognize changes, if any, in handling costs on the site, labor, installation costs, overhead, profit and other expense.

4.10 SUPERINTENDENT

4.10.1 The Contractor shall employ, and have approved by the Owner, a competent superintendent and necessary assistants who shall be in attendance at the Project site during the progress of the Work. The superintendent shall represent the Contractor and all communications given to the superintendent shall be as binding as if given to the Contractor. If the Contractor employs more than a single individual in this role, the Owner shall be provided an organizational chart and personnel listing for the staff performing the functions of a superintendent. In such event, all references to the superintendent elsewhere in the Contract Documents shall mean the staff performing the functions of a superintendent.

4.10.2 The superintendent shall be in attendance at the Project site not less than eight (8) hours per day, five (5) days per week, unless the job is closed down due to conditions 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 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 Contractor or any other entity during the course of the Work.

4.11 PROGRESS SCHEDULE

4.11.1 The Contractor shall prepare and submit to the Owner for the Owner's review and approval an estimated progress schedule for the Work pursuant to the Specifications, Section 013200, Construction Schedules and Reports.

4.12 RESPONSIBILITY FOR COMPLETION

4.12.1 The Contractor shall furnish such manpower, materials, facilities and equipment and shall work within the normal scheduled working hours to ensure the performance of the Work within the Completion Dates specified in the Owner-Contractor Agreement. If for any reason the Contractor must work outside of the normal scheduled working hours, a custodian employed by the Owner is required to be in attendance when accessing the work area. The Contractor agrees to reimburse the Owner at a rate of thirty five dollars (\$35.00) per hour for such custodian's time. The reimbursement is due with the subsequent payment application.

- 4.12.2 If it becomes apparent to the Design Consultant or Owner that the Work will not be completed within required Completion Dates, the Contractor agrees to undertake some or all of the following actions, at no additional cost to the Owner, in order to ensure, in the opinion of the Design Consultant and Owner, that the Contractor will comply with all Completion Date requirements:
- .1 Increase manpower, materials, crafts, equipment and facilities;
 - .2 Increase the number of working hours per shift, shifts per working day, working days per week, or any combination of the foregoing, including but not limited to night shifts, overtime operations and Sundays and holidays;
 - .3 Reschedule activities to achieve maximum practical concurrence of accomplishment of activities;
 - .4 Require that his superintendent be at the Project site not less than ten (10) hours per day, six (6) days per week; and
 - .5 Reimburse the Owner in accordance with Paragraph 4.12.1 above for all work performed outside of the normal scheduled work hours.
- 4.12.3 In undertaking the actions required under Paragraph 4.12.1, Contractor shall comply with the requirements for a recovery schedule set forth in the Specifications, Section 013200, Construction Schedules and Reports.
- 4.12.4 If the actions taken by the Contractor are not satisfactory, the Design Consultant or Owner may direct the Contractor to take any and all actions necessary to ensure completion within the required Completion Dates, without additional cost to the Owner. In such event, the Contractor shall continue to assume responsibility for his performance and for completion within the required dates.
- 4.12.5 If, in the opinion of the Design Consultant or Owner, the actions taken by the Contractor pursuant to this Article or the progress or sequence of the Work are not accurately reflected on the construction schedule, the Contractor shall revise such schedule to accurately reflect the actual progress and sequence of the Work.
- 4.12.6 Failure of the Contractor to substantially comply with the requirements of this Article and the Specifications, Section 013200, Construction Schedules and Reports, may be considered grounds for a determination by the Owner, pursuant to Article 14, that the Contractor is failing to prosecute the Work with such diligence as will ensure its completion within the time specified.
- 4.12.7 The Owner may, at its sole discretion and for any reason, other than due to the fault of Contractor require the Contractor to accelerate the Work by providing overtime, Saturday, Sunday and/or holiday work and/or by having all or any Subcontractors designated by the Owner provide overtime, Saturday, Sunday, and/or holiday work. In the event that the Owner requires such acceleration a Change Order shall be issued in accordance with Article 12.
- 4.12.8 This Section 4.12 does not eliminate the Contractor's responsibility to comply with the local noise ordinances, all highway permit requirements and all other applicable laws, regulations, rules, ordinances, resolutions, and permit requirements.

4.13 DOCUMENTS AND SAMPLES AT THE SITE

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

4.14 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

4.14.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or any Subcontractor, Manufacturer, Supplier or distributor to illustrate some portion of the Work.

4.14.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate a material, product or system for some portion of the Work.

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

4.14.4 Manuals are manufacturer's installation, start-up, operating, and maintenance and repair instructions together with parts lists, pictures, sketches and diagrams, which set forth the manufacturer's requirements for the benefit of the Contractor and the Owner.

4.14.5 The Contractor shall prepare or have prepared at its expense and shall review, indicate approval thereupon, and submit, with reasonable promptness and in such sequence as to cause no delay in the Work or in the other work of the Owner or any Separate Contractor, all Shop Drawings, Product Data, Manuals and Samples required by the Contract Documents.

4.14.5.1 Unless otherwise directed in writing, the Contractor shall submit no less than three (3) copies of each Shop Drawing, Product Data, or Manuals to the Design Consultant. Routing of said submittals will be from the Contractor to the Design Consultant with a copy of the transmittal to the Owner. The Design Consultant will return one (1) copy of the reviewed submittal to the Contractor.

4.14.5.2 Where the Contract calls for the submittal of manufacturer's data to the Design Consultant for information only, such submittals shall be made before the commencement of any portion of the Work requiring such submission. Work performed without benefit of approved Shop Drawings for any portion of the Work is subject to removal and replacement at no cost to the Owner.

4.14.5.3 For standard manufactured items not requiring special Shop Drawings for manufacture, Contractor shall submit no less than three (3) copies of Manufacturer's catalogue sheets showing illustrated cuts of item to be furnished, scale details, sizes, dimensions, performance characteristics, capacities, wiring diagrams and controls, and all other pertinent information. One (1) copy of reviewed submissions will be returned to the Contractor.

4.14.5.4 Unless otherwise directed in writing, all other Shop Drawings, Contractor shall submit no less than three (3) legible copies of each drawing. Each drawing shall have a clear space for stamps. When phrase "by others" appears on Shop Drawings, the Contractor shall indicate on the Shop

Drawing who is to furnish material or operations so marked before submittal. When the Shop Drawings are checked "revise and resubmit", the Contractor shall make corrections and submit new copies for review. The Shop Drawings shall contain the Contractor's "approval" and corrections.

- 4.14.5.5 For use of all trades, the Contractor shall provide such number of Shop Drawings as is required for field distribution.
- 4.14.5.6 The Design Consultant will review submittals and make marks to indicate corrections or revisions required and will stamp each submittal with an action stamp and will mark the stamp with the action required by the Contractor.
- 4.14.5.7 Contractor shall submit names of proposed Manufacturers, Material Suppliers, dealers, who are to furnish materials, fixtures, appliances or other fittings for approval as early as possible, to afford proper investigation and checking.
- 4.14.5.8 Transactions with manufacturers, or Subcontractors, shall be through Contractor.
- 4.14.5.9 Unless otherwise specified, Contractor shall submit samples in duplicate of adequate size showing quality, type, color range, finish, and texture as indicated in the Specifications.
- 4.14.5.10 Where Specifications require manufacturer's printed installation instructions, Contractor shall submit duplicate copies of such instructions for approval.
- 4.14.5.11 When several materials are specified by name for one use, Contractor shall select for use any of those so specified.
- 4.14.5.12 Whenever item or class of material is specified exclusively by trade name, manufacturer's name, or by catalogue reference, Contractor shall use only such item, unless written approval for substitution is secured, as outlined in the Specifications and in Section 4.15 of the General Conditions.
- 4.14.5.13 Contractor shall not order materials until receipt of written approval. Contractor shall furnish materials equal in every respect to approved samples.
- 4.14.6 By approving and submitting Shop Drawings, Product Data, Manuals and Samples, the Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related thereto, and that he has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents. The Contractor shall adhere to any supplementary processing and scheduling instructions pertaining to Shop Drawings, which may be issued by the Design Consultant.
- 4.14.6.1 Parts and details not fully indicated on the Drawings shall be detailed by the Contractor in accordance with standard engineering practice. Dimensions on the Drawings, as well as detailed drawings themselves are subject in every case to measurements of existing, adjacent, incorporated and completed, which shall be taken by the Contractor before undertaking any Work dependent on such data.
- 4.14.7 The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Design Consultant's review of Shop Drawings, Product Data, Samples or Manuals under Paragraph 2.2.14 unless the Contractor has specifically informed the

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

- 4.14.8 The Contractor shall make corrections required by the Design Consultant and shall resubmit the required number of corrected copies of Shop Drawings or new Product Data or Samples. The Contractor shall direct specific attention, in writing on resubmitted Shop Drawings, Product Data or Samples or Manuals, to revisions other than those requested by the Design Consultant on previous submittals. Re-submittals necessitated by required corrections due to Contractor's errors or omissions shall not be cause for extension of Contract Time or an increase in the Contract Sum.
- 4.14.8.1 No portion of the Work requiring submission of Shop Drawings, Product Data, Samples or Manuals shall be commenced until the submittal has been approved by the Design Consultant as provided in Article 2. All such portions of the Work shall be in accordance with approved submittals.
- 4.14.9 Shop Drawings, Product Data and Samples shall be dated and shall bear the name of the Project; a description or the names or equipment, materials and items; and complete identification of locations at which materials or equipment are to be installed. Shop Drawings shall be stamped and signed stating that the Contractor has determined and verified all materials, field measurements, and field construction criteria related thereto and that he has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.
- 4.14.10 Submittals of Shop Drawings, Product Data, Samples or Manuals shall be accompanied by a transmittal letter, in duplicate, containing the name of the Project, the Contractor's name, the number of Shop Drawings, Product Data, Samples, or Manuals, identification of Specification section and other pertinent data.
- 4.15 EQUAL PRODUCTS AND SUBSTITUTIONS
- 4.15.1 All materials, supplies and articles furnished under the Contract shall, whenever specified and otherwise practicable, be the standard products of recognized, reputable manufacturers. Unless otherwise specifically provided in the Contract Documents, the naming of a certain brand, make, manufacturer or article, device, product, material, fixture or type of construction shall convey the general style, type, character and standard of quality of the article desired and shall not be construed as limiting competition. The Contractor, in such cases, may with Owner's written approval, use any brand, make, manufacturer, article, device, product, material, fixture, form or type of construction which in the judgment of the Design Consultant is equal to that specified. An item may be considered equal to the item so named or described if, in the opinion of the Owner and Design Consultant (1) it is at least equal in quality, durability, appearance, strength, and design; (2) it will perform at least equally the specific function imposed by the general design for the Work being contracted for or the material being purchased; and (3) it conforms substantially, even with deviations, to the detailed requirements for the item in the Specifications. Approval by the Owner and Design Consultant will be granted based upon considerations of quality, workmanship, economy of operation, suitability for the purpose intended, warranty and acceptability for use on the Project.
- 4.15.2 To obtain such approval on makes or brands of material other than those specified in Contract Documents, and not previously approved at the time the Owner received bids for the

construction of the Project, the Contractor's request for approval of any substitution shall include:

- .1 Complete data substantiating compliance of the proposed substitution with the Contract Documents;
- .2 Product identification including manufacturers' name, address, and phone number;
- .3 Manufacturer's literature showing complete product description, performance and test data, and all reference standards;
- .4 Samples and colors in the case of articles or products;
- .5 Names and addresses of similar projects on which the product was used and date of installation;
- .6 For construction methods, include a detailed description for the proposed method and drawings illustrating same;
- .7 Itemized comparison of proposed substitution with product or method specified and any cost reduction, which shall benefit the Owner;
- .8 Accurate cost data on proposed substitution in comparison with product or method specified;
- .9 All directions, specifications, and recommendations by manufacturers for installation, handling, storing, adjustment, and operation; and
- .10 Item by item comparison of characteristics of substitution item with those items specified.

4.15.3 The Contractor shall also submit with his request for approval a sworn and notarized statement which shall include all of the following representations by the Contractor, namely that:

- .1 He has investigated the proposed product or method and determined that it is equal or better in all respects to that specified and that it fully complies with all requirements of the Contract Documents;
- .2 He will meet all contract obligations with regard to this substitution;
- .3 He will coordinate installation of accepted substitutions into the Work, making all such changes and any required schedule adjustments, at no additional cost to the Owner, as may be required for the Work to be complete in all respects;
- .4 He waives all Claims for additional costs and additional time related to substitutions, which consequently become apparent. He also agrees to hold the Owner harmless from Claims for extra costs and time incurred by other Subcontractors and suppliers, or additional services which may have to be performed by the Design Consultant, for changes for extra work that may, at some later date, be determined to be necessary in order for the Work to function in the manner intended in the Contract Documents;
- .5 He will provide the same warranty and guarantee, and perform any work required in accordance therewith, for the substitution that is applicable to the specified item for which

the substitution is requested;

- .6 Material will be installed, handled, stored, adjusted, tested, and operated in accordance with the manufacturers' recommendation and as specified in the Contract Documents.
 - .7 In all cases new materials will be used unless this provision is waived by Notice from the Owner or his Design Consultant, or unless otherwise specified in the Contract Documents;
 - .8 All material and workmanship will be in every respect in accordance with that which, in the opinion of the Owner or Design Consultant, is in conformity with approved modern practice; and
 - .9 He has provided accurate cost data on the proposed substitution in comparison with the product or method specified.
- 4.15.4 Subject to the provisions of any applicable laws, approval for substitutions or equal products shall be at the sole discretion of the Owner, shall be in writing to be effective, and the decision of the Owner shall be final. The Owner or Design Consultant may require tests of all materials proposed for substitution so submitted to establish quality standards, at the Contractor's expense. After approval of a substitution, if it is determined that the Contractor submitted defective information or data regarding the substitution upon which Owner's approval was based, and that unexpected or un contemplated extensive redesign or rework of the Project will be required in order to accommodate the substitution, or that the substituted item will not perform or function as well as the specified item for which substitution was requested, the Contractor will be required to furnish the original specified item or obtain approval to use another substitution; the Contractor shall pay all costs, expenses or damages associated with or related to the unacceptability of such a substitution and the resultant utilization of another item and no time extension shall be granted for any delays associated with or related to such substitution.
- 4.15.5 If a substitution is approved, no further change in brand or make will be permitted unless satisfactory, written evidence is presented to and approved by the Owner that the manufacturer cannot make scheduled delivery of the approved substituted item. The Owner will not consider substitutions for approval if:
- .1 The proposed substitution is indicated or implied on the Contractor's Shop Drawing or product data submittal and has not been formally submitted for approval by the Contractor in accordance with the above-stated requirements, or
 - .2 Acceptance of the proposed substitution will require substantial design revisions to the Contract Documents or is otherwise not acceptable to the Owner and Design Consultant.
- 4.15.6 Except as otherwise provided for by the provisions of any applicable laws, the Contractor shall not have any right of appeal from the decision of the Owner rejecting any materials submitted if the Contractor fails to obtain the approval for substitution under this Article.

4.16 USE OF SITE

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

4.17 CUTTING AND PATCHING OF WORK

4.17.1 The Contractor shall be responsible for all cutting, fitting or patching that may be required to complete the Work or to make its several parts fit together properly and in accordance with the Contract Documents.

4.17.2 The Contractor shall not damage or endanger any portion of the Work or the work of the Owner or any Separate Contractors by cutting, patching or otherwise altering any work, or by excavation. The Contractor shall not cut or otherwise alter the work of the Owner or any Separate Contractor except with the written consent of the Owner and of such Separate Contractor. The Contractor shall not unreasonably withhold from the Owner or any Separate Contractor his consent to cutting or otherwise altering the Work. The Owner shall not be required to accept work with a cut, splice, or patch when such cut, splice or patch is not generally accepted practice for the particular work involved or is otherwise unworkmanlike in the opinion of the Design Consultant or the Owner.

4.17.3 Existing structures and facilities including but not limited to building, utilities, topography, streets, curbs, walks, etc., that are damaged or removed due to required excavations or other construction work, shall be patched, repaired or replaced by the Contractor to satisfaction of the Design Consultant and the Owner of such structures and facilities and authorities having jurisdiction. In event the local jurisdictional authorities require that such repairing and patching be done with their own labor and materials, the Contractor shall abide by such regulations and pay for such work with no increase in the Contract Sum.

4.18 CLEANING UP

4.18.1 The Contractor at all times shall keep the premises free from accumulation of waste materials or rubbish caused by his operations. At the completion of the Work and before final payment is made, he shall remove all his waste materials and rubbish from and about the Project as well as all his tools, construction equipment, machinery and surplus materials.

4.18.2 If the Contractor fails to clean up during or at the completion of the Work, the Owner may do so as provided in Section 6.3 and the cost thereof shall be charged to the Contractor.

4.19 COMMUNICATIONS

4.19.1 All communications from the Contractor relating to the Contract Documents or the construction schedule will be directed to the Design Consultant and copied to the Owner. Similarly, all correspondence from the Owner or Design Consultant will be directed to the Contractor and

copied to the Owner or Design Consultant.

4.20 ROYALTIES AND PATENTS

4.20.1 The Contractor shall pay all royalties and license fees. He shall defend all suits or claims for infringement of any patent rights arising out of the Work and shall save the Owner harmless from loss on account thereof.

4.21 INDEMNIFICATION

4.21.1 To the fullest extent permitted by law, the Contractor shall, at its sole cost and expense, indemnify, defend, and hold harmless the Owner and its agents, representatives, and employees from and against all claims, actions, judgments, costs, liabilities, penalties, damages, losses and expenses, including but not limited to attorneys' fees, arising out of and/or resulting from the performance of the Work, provided that any such claim, action, judgment, cost, liability, penalty, damage, loss or expense is caused by any negligent act, error or omission of the Contractor, any Subcontractor or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be legally liable. The above obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this Section 4.21.1. The parties agree that this indemnification clause is an "evidence of indebtedness" for purpose of N.C. Gen. Stat. § 6-21.2. The parties also specifically acknowledge that the Owner is a public body and it is the intent of the parties that the Owner not incur any expenses when the Contractor is solely responsible for the claims.

4.21.2 In any and all claims against the Owner or the Design Consultant or any of their agents, representatives, or employees by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this Section 4.21 shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts.

4.21.3 No provision of this Section 4.21 shall give rise to any duties on the part of the Design Consultant or the Owner, or any of their agents, representatives, or employees.

4.22 PERSONS AUTHORIZED TO SIGN DOCUMENTS

4.22.1 The Contractor, within five (5) days after the earlier of the date of a Notice to Proceed or the date of the Owner-Contractor Agreement, shall file with the Owner a list of all persons who are authorized to sign documents such as contracts, certificates, and affidavits on behalf of the Contractor and to fully bind the Contractor to all the conditions and provisions of such documents, except that in the case of a corporation he shall file with the Owner a certified copy of a resolution of the Board of Directors of the corporation in which are listed the names and titles of corporation personnel who are authorized to sign documents on behalf of the corporation and to fully bind the corporation to all the conditions and provisions of such documents.

4.23 CONDITIONS AFFECTING THE WORK

4.23.1 The Contractor shall be responsible for taking all steps necessary to ascertain the nature and location of the Work and the general and local conditions that can affect the Work or the cost

thereof. Failure by the Contractor to fully acquaint himself with conditions which may affect the Work, including, but not limited to conditions relating to transportation, handling, storage of materials, availability of labor, water, roads, weather, topographic and subsurface conditions, Multi-Prime Contract conditions, applicable provisions of law, and the character and availability of equipment and facilities needed prior to and during the execution of the Work, shall not relieve the Contractor of his responsibilities under the Contract Documents and shall not constitute a basis for an adjustment in the Contract Sum or the Contract Time under any circumstances. The Owner assumes no responsibility for any understanding or representation about conditions affecting the Work made by any of his officers, employees, representatives, or agents prior to the execution of the Contract, unless such understandings or representations are expressly stated in the Contract Documents.

- 4.23.2 If in the execution of the Work any valuable items or materials of any kind are discovered buried or hidden within the Work, such items or materials shall be the property of the Owner. The Contractor shall take reasonable precautions to prevent any persons from removing or damaging such items or materials and shall immediately upon discovery thereof and before removal, acquaint the Owner or the Design Consultant with such discovery and carry out, at the expense of the Owner, the Owner's or the Design Consultant's orders as to disposal of the same.

4.24 COMPLIANCE WITH BOARD POLICIES AND PROCEDURES

The Contractor acknowledges that Board policies are available for review at www.harnett.k12.nc.us and agrees to comply with the policies. The Contractor also agrees to comply with the following provisions:

- 4.24.1 The Contractor, its Subcontractors and employees shall not possess or carry, whether openly or concealed, any gun, rifle, pistol, or explosive on any property owned by the Owner. This includes firearms locked in containers, vehicles or firearm racks within vehicles. The Contractor, its Subcontractors and employees shall not cause, encourage or aid a minor, who is less than 18 years old to possess or carry, whether openly or concealed, any weapons on any property owned by the Owner.
- 4.24.2 The Contractor, its Subcontractors and employees, are prohibited from profane, lewd, obscene or offensive conduct or language, including engaging in sexual harassment.
- 4.24.3 The Contractor and its Subcontractors shall not manufacture, transmit, conspire to transmit, possess, use or be under the influence of any alcoholic or other intoxicating beverage, narcotic drug, hallucinogenic drug, amphetamine, barbiturate, marijuana or anabolic steroids, or possess, use, transmit or conspire to transmit drug paraphernalia on any property owned by the Owner.

- 4.24.4 The Contractor and its Subcontractors may not at any time use or display tobacco or nicotine-containing products, including but not limited to electronic cigarettes (e-cigarettes), on school premises, both indoor and outdoor. The prohibition of the display of tobacco or nicotine products shall not extend to a display that has a legitimate instructional or pedagogical purpose. For purposes of this Contract, “tobacco product” is defined to include cigarettes, cigars, blunts, bidis, pipes, chewing tobacco, snuff, and any other items containing or reasonably resembling tobacco, tobacco products, or any facsimile thereof. “Tobacco use” includes smoking, chewing, dipping, or any other use of tobacco products.
- 4.24.5 The Contractor, its Subcontractors and employees shall not solicit from or sell to students or staff within the Owner’s facilities or campuses, and shall not give gifts of any value to school system employees.
- 4.24.6 Operators of all commercial vehicles on any property owned by the Owner shall be subject to post-accident, random, reasonable suspicion and follow-up testing for drugs and alcohol.
- 4.24.7 The Contractor, its Subcontractors and employees are prohibited from using access to the site pursuant to this Agreement as a means to date, court, or enter into a romantic or sexual relationship with any student enrolled in the Harnett County Schools. The Contractor agrees to indemnify the Owner for claims against the Owner resulting from relationships which have occurred or may occur between a student and an employee of the Contractor or Subcontractor.
- 4.24.8 Lunsford Act/Criminal Background Checks. The Contractor shall conduct at its own expense sexual offender registry checks on each of its owners, employees, agents, or Subcontractors (“contractual personnel”) who will engage in any service on or delivery of goods to school system property or at a school-system sponsored event, except checks shall not be required for individuals who are solely delivering or picking up equipment, materials, or supplies at: (1) the administrative office or loading dock of a school; (2) non-school sites; (3) schools closed for renovation; or (4) school construction sites.. The checks shall include at a minimum checks of the State Sex Offender and Public Protection Registration Program, the State Sexually Violent Predator Registration Program, and the National Sex Offender Registry (“the Registries”). For the Contractor’s convenience only, all of the required registry checks may be completed at no cost by accessing the United States Department of Justice Sex Offender Public Website at [http:// www. nsopw.gov/](http://www.nsopw.gov/). The Contractor shall provide certification that the registry checks were conducted on each of its contractual personnel providing services or delivering goods under this Agreement prior to the commencement of such services or the delivery of such goods. The Contractor shall conduct a current initial check of the registries (a check done more than 30 days prior to the date of this Agreement shall not satisfy this contractual obligation). In addition, Contractor agrees to conduct the registry checks and provide a supplemental certification before any additional contractual personnel are used to deliver goods or provide services pursuant to this Agreement. Contractor further agrees to conduct annual registry checks of all contractual personnel and provide annual certifications at each anniversary date of this Agreement. Contractor shall not assign any individual to deliver goods or provide services pursuant to this Agreement if said individual appears on any of the listed registries. Contractor agrees that it will maintain all records and documents necessary to demonstrate that it has conducted a thorough check of the registries as to each contractual personnel, and agrees to provide such records and documents to the school system upon request. Contractor specifically acknowledges that the school system retains the right to audit these records to ensure compliance with this Section at any time in the school system’s sole discretion. Failure to comply with the terms of this provision shall be grounds for immediate termination of the Agreement. In addition, the Owner may conduct additional criminal records checks at the

Owner's expense. If the school system exercises this right to conduct additional criminal records checks, Contractor agrees to provide within seven (7) days of request the full name, date of birth, state of residency for the past ten years, and any additional information requested by the school system for all contractual personnel who may deliver goods or perform services under this Agreement. Contractor further agrees that it has an ongoing obligation to provide the school system with the name of any new contractual personnel who may deliver goods or provide services under the Agreement. The Owner reserves the right to prohibit any contractual personnel of Contractor from delivering goods or providing services under this Agreement if the Owner determines, in its sole discretion, that such contractual personnel may pose a threat to the safety or well-being of students, school personnel or others.

- 4.24.9 Contractor shall not employ any individuals to provide services to the Owner who are not authorized by federal law to work in the United States. Contractor represents and warrants that it is aware of and in compliance with the Immigration Reform and Control Act and North Carolina law (Article 2 of Chapter 64 of the North Carolina General Statutes) requiring use of the E-Verify system for employers who employ twenty-five (25) or more employees and that it is and will remain in compliance with these laws at all times while providing services pursuant to this Agreement. Contractor shall also ensure that any of its Subcontractors (of any tier) will remain in compliance with these laws at all times while providing subcontracted services in connection with this Agreement. Contractor is responsible for providing affordable health care coverage to all of its full-time employees providing services to the School System. The definitions of "affordable coverage" and "full-time employee" are governed by the Affordable Care Act and accompanying IRS and Treasury Department regulations.
- 4.24.10 The Contractor, its Subcontractors and employees shall not interact with any students. Nothing in Paragraph 4.24 shall be construed to prevent the Contractor, its Subcontractors and employees from taking necessary measures to protect students, staff or other employees.
- 4.24.11 The Contractor shall at all times enforce strict discipline and good order among its employees and shall not employ any unfit person or anyone not skilled in the task assigned to it. The Owner may require the Contractor to remove any employee the Owner deems incompetent, careless or otherwise objectionable.
- 4.24.12 All agents and workers of the Contractor and its Subcontractors shall wear identification badges provided by the Contractor at all times they are on the Owner's property. The identification badges shall at a minimum display the company name, telephone number, employee name and a picture of the employee.
- 4.24.13 The Contractor shall comply with the Owner's site or school building access procedures when working on any existing school campus.
- 4.24.14 Anti-Nepotism. The Contractor warrants that, to the best of its knowledge and in the exercise of due diligence, none of its corporate officers, directors, or trustees and none of its employees who will directly provide services under this Agreement are immediate family members of any member of the Owner's Board of Education or of any principal or central office staff administrator employed by the Owner. For purposes of this provision, "immediate family" means spouse, parent, child, brother, sister, grandparent, or grandchild, and includes step, half, and in-law relationships. Should Contractor become aware of any family relationship covered by this provision or should such a family relationship arise at any time during the term of this Agreement, Contractor shall immediately disclose the family relationship in writing to the

Superintendent. Unless formally waived by the Owner, the existence of a family relationship covered by this Agreement is grounds for immediate termination by Owner without further financial liability to Contractor.

ARTICLE 5

SUBCONTRACTORS

5.1 DEFINITION

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

5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform any of the Work at the site or who contracts to perform or supply any of the Work under the scope of a Subcontractor's subcontract. The term Sub-subcontractor may be referred to throughout the Contract Documents as if singular in number and masculine in gender and means a Sub-subcontractor or an authorized representative thereof.

5.1.3 Nothing contained in the Contract Documents is intended to, nor shall it create, any contractual relationship between the Owner, the Design Consultant, or any of their agents, consultants, employees, independent contractors, or representatives and any Subcontractor, Sub-subcontractor, Supplier or Vendor of the Contractor, except the relationship between Owner and Contractor, but the Owner shall be entitled to performance of all obligations intended for his benefit, and to enforcement thereof.

5.1.4 The Owner and Design Consultant will not deal directly with any Subcontractor, Sub-subcontractor or Material Supplier. Communication will be made only through the Contractor. Subcontractor, Sub-subcontractors or Material Suppliers shall route requests for information or clarification through the Contractor to the Design Consultant.

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

5.2.1 The Contractor, in compliance with the requirements of the Contract Documents and within ten (10) days after the Notice to Proceed, shall furnish in writing to the Owner the names of the persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each of the principal portions of the Work. The Owner will promptly reply to the Contractor in writing stating whether or not the Owner, after due investigation, has reasonable objection to any such proposed person or entity. Failure of the Owner to reply within a reasonable time shall constitute notice of no reasonable objection. The Contractor understands and agrees that no contractual agreement exists for any part of the Work under this Contract between the Owner and any of the Contractor's Subcontractors or Sub-subcontractors. Further, the Contractor understands and agrees that he alone is responsible to the Owner for the Work under this Contract and that any review of Subcontractors or Sub-subcontractors by the Owner will not in any way make the Owner responsible to any Subcontractor, nor responsible for the actions or failures of any Subcontractor or Sub-subcontractor.

- 5.2.1.1 The Contractor shall identify in the list of names of the Subcontractors proposed, those Subcontractors that are Historically Underutilized Businesses (HUB's) and indicate the portion of the Work that each Subcontractor will perform.
- 5.2.2 The Contractor shall not contract with any such proposed person or entity to whom the Owner has made reasonable objection under the provisions of Paragraph 5.2.1. The Contractor shall not be required to contract with anyone to whom he has a reasonable objection.
- 5.2.3 If the Owner has reasonable objection to any proposed person or entity under Paragraph 5.2.1, the Contractor shall name a substitute to whom the Owner has no reasonable objection. The Contract Sum shall be increased or decreased by the difference in cost occasioned by such substitution and an appropriate Change Order shall be issued, subject to an audit of said difference by the Owner; provided, however, that no increase in the Contract Sum shall be allowed for any such substitution unless the Contractor has acted promptly and responsively in submitting names as required by Paragraph 5.2.1 and the original proposed Subcontractor was: (i) able to carry out his work under his proposed subcontract, (ii) able to comply with all applicable laws, (iii) was an ongoing business in the field of his proposed subcontract, and (iv) had a labor force, capital and a means of supply compatible with the scope of his proposed subcontract.
- 5.2.4 If the Owner requires a change of any proposed Subcontractor or person or organization previously accepted by him on the Project, the Contract Sum shall be increased or decreased by the difference in cost occasioned by such change and an appropriate Change Order shall be issued, subject to an audit by Owner.
- 5.2.5 The Contractor shall notify the Owner and the Design Consultant of any substitution for any Subcontractor identified in accordance with Subparagraph 5.2.1.1. The Contractor shall make no substitution for any Subcontractor, person or entity previously selected if the Owner or the Design Consultant makes reasonable objection to such substitution. Also, Contractor may make no substitution of Subcontractors in violation of applicable law.
- 5.2.6 If during the duration of the Project, the Contractor effects a substitution for any Subcontractor per Paragraph 5.2.5, or if additional subcontract opportunities become available, the Contractor shall make a good faith effort to utilize Historically Underutilized Businesses (HUB's).

5.3 SUBCONTRACTUAL RELATIONS

- 5.3.1 By an appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by the terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by these Contract Documents, assumes toward the Owner. Said agreement shall preserve and protect the rights of the Owner under the Contract Documents with respect to the Work to be performed by the Subcontractor so that the subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the agreement between the Contractor and Subcontractor, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by these Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with his Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract, copies of the Contract Documents to which the Subcontractor will be bound by this Section 5.3, and identify to the Subcontractor any terms and conditions of the proposed Subcontract which may be at variance

with the Contract Documents. Each Subcontractor shall similarly make copies of such Contract Documents available to his Sub-subcontractors.

5.3.2 The provisions herein regarding Subcontractor approvals shall in no way affect the liability of the Contractor to the Owner regarding performance of all obligations by or payment of Subcontractors. Approval to subcontract with any given Subcontractor shall not to any degree relieve the Contractor of his obligation to perform or have performed to the full satisfaction of the Owner the Work required by this Contract.

5.3.3 The Contractor shall submit Notice to the Owner of any Claims by Subcontractors for which the Owner is believed to be responsible, in strict conformance with the same time requirements and other procedures established for the submission of the Contractor's Claims to the Owner.

5.4 QUALIFICATION SUBMITTALS

5.4.1 Specific qualification submittals may be required of Subcontractors, installers and suppliers for certain critical items of the Work. Required qualification submittals are set forth in detail in the Specifications and shall be collected and submitted by the Contractor for review and approval by the Design Consultant. All information required of a single Subcontractor, installer or supplier shall be contained in a single, complete submittal. The Contractor shall submit the required qualification information within ten (10) days after receipt of the Design Consultant's request.

5.4.2 The Owner and Design Consultant shall reject any proposed Subcontractor, installer or supplier, or any qualification submittals related thereto, for the following reasons:

- .1 The Contractor's failure to submit requested information within the specified time; or
- .2 The Contractor's failure to provide all of the requested information; or
- .3 The Contractor's submission of a Subcontractor, installer or supplier, or qualifications thereof, which are unacceptable in the judgment of the Owner or Design Consultant.

5.4.3 Should the Owner or Design Consultant have reasonable objection to any proposed Subcontractor, installer or supplier, the Contractor shall submit another person or firm who are reasonably acceptable to the Owner and Design Consultant.

5.5 PREPARATORY WORK

5.5.1 Before starting a portion of the Work, the Contractor and the responsible Subcontractor shall carefully examine all preparatory work that has been executed to receive his work. The Subcontractor shall check carefully, by whatever means are required, to ensure that his work and adjacent related work will finish to proper contours, planes and levels. He shall promptly notify the Contractor and the Design Consultant of any defects or imperfections in preparatory work, which will, in any way, affect satisfactory completion of his work. Absence of such notification will be construed as an acceptance of preparatory work and later Claims of defects therein will not be recognized.

5.5.2 Under no conditions shall a portion of the Work proceed prior to preparatory work having been completed, cured, dried, and otherwise made satisfactory to receive such related work. Responsibility for timely installation of all materials rests solely with the Contractor, who shall maintain coordination control at all times.

ARTICLE 6

WORK BY OWNER OR BY SEPARATE CONTRACTORS

- 6.1 OWNER'S RIGHT TO PERFORM WORK AND TO AWARD SEPARATE CONTRACTS
- 6.1.1 The Owner reserves the right to perform work related to the Project with his own forces, and to award separate contracts in connection with other portions of the Project or other work on the site under these or similar conditions of the Contract.
- 6.1.2 When separate contracts are awarded for different portions of the Project or other work on the site, the term Contractor in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.
- 6.2 MUTUAL RESPONSIBILITY
- 6.2.1 The Contractor shall afford Separate Contractors and the Owner reasonable opportunity for the introduction and storage of their materials and equipment and the execution of their work and shall properly connect and coordinate the Work with that of the Owner and other contractors to store his apparatus, materials, supplies and equipment in such orderly fashion at the site of the Work as will not unduly or unreasonably interfere with the progress of the Work or the work of any other contractors.
- 6.2.1.1 If the execution or result of any part of the Work depends upon any work of the Owner or of any Separate Contractor, the Contractor shall, prior to proceeding with the Work, inspect and promptly report to the Owner in writing any apparent discrepancies or defects in such work of the Owner or of any Separate Contractor that render it unsuitable for such proper execution or result of any part of the Work.
- 6.2.1.2 Failure of the Contractor to so inspect and report shall constitute an acceptance of the Owner's or Separate Contractor's work as fit and proper to receive the Work, except as to defects which may develop in the Owner's or Separate Contractor's work after completion of the Work and which the Contractor could not have discovered by its inspection prior to completion of the Work.
- 6.2.2 Should the Contractor cause damage to the Work or property of the Owner or of any Separate Contractor on the Project, or to other work on the site, or delay or interfere with the Owner's work on ongoing operations or facilities or adjacent facilities or said Separate Contractor's work, the Contractor shall be liable for the same; and, in the case of another contractor, the Contractor shall attempt to settle said Claim with such other contractor prior to such other contractor's institution of litigation or other proceedings against the other contractor.
- 6.2.2.1 Should a Separate Contractor be declared in default by the Owner, the Owner shall not be obligated to hire a contractor to perform the work of the Separate Contractor during the time the Separate Contractor's surety is remedying the default pursuant to Paragraph 3.4.2.
- 6.2.2.2 If such Separate Contractor sues the Owner or Design Consultant on account of any damage, delay or interference cause or alleged to have been caused by the Contractor, the Owner shall notify the Contractor, who shall defend the Owner and Design Consultant in such proceedings at the Contractor's expense. If any judgment or award is entered against the Owner or Design

Consultant in such proceedings, the Contractor shall satisfy the same and shall reimburse the Owner and Design Consultant for all damages, expenses, attorney's fees and other costs which the Owner or Design Consultant incurs as a result thereof.

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

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

6.2.4 Whenever Contractor receives items from another contractor or from Owner for storage, erection or installation, the Contractor receiving such items shall give receipt for items delivered, and thereafter will be held responsible for care, storage and any necessary replacing of item or items received.

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

6.3 OWNER'S RIGHT TO PERFORM DISPUTED WORK

6.3.1 If a dispute arises between the Contractor and Separate Contractors as to their responsibility for cleaning up as required by Section 4.18 or for accomplishing coordination or doing required cutting, filling, excavating or patching as required by Section 4.17, the Owner may carry out such work and charge the cost thereof to the responsible party as the Owner shall determine to be just.

6.4 COORDINATION OF THE WORK

6.4.1 By entering into this Contract, Contractor acknowledges that there may be other contractors on the site whose work will be coordinated with that of his own. Contractor expresses, warrants and guarantees that he will cooperate with other contractors and will do nothing to delay, hinder or interfere with the work of other Separate Contractors, the Owner or Design Consultant. Contractor also expressly agrees that, in the event his work is hindered, delayed, interfered with or otherwise affected by a Separate Contractor, his sole remedy will be a direct action against the Separate Contractor as described in this Article 6. Contractor will have no remedy, and hereby expressly waives any remedy, against the Owner and/or the Design Consultant on account of delay, hindrance, interference or other event caused by a Separate Contractor.

ARTICLE 7

MISCELLANEOUS PROVISIONS

7.1 GOVERNING LAW

7.1.1 This Contract shall be governed by the laws of the State of North Carolina. The Contractor and Owner agree that Harnett County, North Carolina shall be the proper venue for any litigation arising out of this Agreement.

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

7.2 SUCCESSORS AND ASSIGNS

7.2.1 The Owner and the Contractor each binds himself, his partners, successors, assigns and legal representatives to the other party hereto and to the partners, successors, assigns and legal representatives of such other party in respect to all covenants, agreements and obligations contained in the Contract Documents. The Contractor shall not assign the Contract or sublet it as a whole without the written consent of the Owner, nor shall the Contractor assign any moneys due or to become due to him hereunder, without the previous written consent of the Owner and the Contractor's Surety.

7.3 CLAIMS AND DAMAGES

7.3.1 Should the Contractor, Subcontractor or any Sub-subcontractor suffer injury or damage to person or property because of any act or omission of the Owner or Design Consultant, or of any of their employees, agents or others for whose acts either is legally liable, the Claim on behalf of the Contractor its Subcontractors or Sub-subcontractors shall be made by giving Notice to the Owner, as provided in Article 15 ; otherwise, the Contractor, Subcontractors and Sub-subcontractors shall have waived any and all rights he may have against the Owner or the Design Consultant, or their employees, representatives and agents. The Contractor shall indemnify, defend and hold the Owner harmless from any Claim by a Subcontractor that is waived because it is not filed in strict conformance with this Paragraph or any other provision of the Contract regarding Claims.

7.4 PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

7.4.1 The Contractor shall furnish bonds covering the faithful performance of the Contract and the payment of all obligations arising thereunder in a form and with a Surety satisfactory to the Owner.

7.4.2 The Contractor is required to furnish in duplicate a Performance Bond and a Labor and Material Payment Bond, each in the amount of one hundred percent (100%) of the Contract Sum, written by a surety company licensed to do business in North Carolina and with a minimum AM Best "A" rating or comparable rating from another service reasonably acceptable to Owner.

7.5 RIGHTS AND REMEDIES

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

- 7.5.2 Except as may be specifically agreed in writing, the failure of the Owner or the Design Consultant to insist in any one or more instances upon the strict performance of any one or more of the provisions of the Contract, or to exercise any right herein contained or provided by law, shall not be construed as a waiver or relinquishment of the performance of such provisions or right(s) or of the right to subsequently demand such strict performance or exercise such right(s), and the rights shall continue unchanged and remain in full force and effect.
- 7.5.3 The Contractor agrees that he can be adequately compensated by money damages for any breach of the Contract which may be committed by the Owner and hereby agrees that no default, act, or omission of the Owner or the Design Consultant, except for failure to make progress payments as required by the Contract Documents, shall constitute a material breach of the Contract entitling the Contractor to cancel or rescind the provisions of the Contract or (unless the Owner shall so consent or direct in writing) to suspend or abandon performance of all or any part of the Work. The Contractor hereby waives any and all rights and remedies to which he might otherwise be or become entitled, save only his right to money damages.
- 7.6 TESTS AND INSPECTIONS
- 7.6.1 If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any portion of the Work to be inspected, tested, or approved, the Contractor shall give the Owner and Design Consultant timely Notice of its readiness so the Design Consultant and the Owner may observe such inspection, testing or approval. Unless otherwise specifically provided in the Contract Documents, the Contractor shall bear all costs of such inspections, tests or approvals, except that Owner shall pay for “special inspections” as defined and required in Section 1704, the North Carolina State Building Code, or successor section. In the event that such “special inspections” reveal a failure of the Work to comply with the Contract Documents or applicable laws, ordinances, regulations or orders of public authorities having jurisdiction, Contractor shall reimburse the Owner for the costs of such “special inspections”.
- 7.6.1.1 Unless otherwise stipulated in the Contract Documents, the Contractor shall pay for all utilities required for testing of installed equipment of all of his work and work of each Subcontractor. Boiler fuel other than gas shall be provided by Subcontractor furnishing boilers. Labor and supervision required for making such tests shall be provided at no additional cost to the Owner.
- 7.6.2 If the Design Consultant or the Owner determines that any portion of the Work requires additional inspection, testing, or approval which Paragraph 7.6.1 does not include, the Owner will instruct the Contractor to order such additional inspection, testing or approval, and the Contractor shall give Notice as provided in Paragraph 7.6.1. If such additional inspection or testing reveals a failure of any portion of the Work to comply (1) with the requirements of the Contract Documents, or (2) with respect to the performance of the Work, with laws, ordinances, rules, regulations, or orders of any public authority having jurisdiction, the Contractor shall bear all costs thereof, including compensation for the Design Consultant's and Owner's additional construction management expenses made necessary by such failure.
- 7.6.3 With regard to inspections and tests, the costs of which the Owner is responsible for paying, they will be made by a pre-qualified, independent testing agency selected by the Owner. The cost of the initial services of such agency will be paid by the Owner. When the initial tests indicate non-compliance with the Contract Documents, any subsequent testing occasioned by non-compliance shall be performed by the same agency and the cost thereof shall be borne by the Contractor. Representatives of the testing agency shall have access to the Work at all times.

The Contractor shall provide facilities for such access in order that the agency may properly perform its functions.

7.6.4 The independent testing agency, contracted by the Owner, shall prepare the test reports, logs, and certificates applicable to the specific inspections and tests and promptly deliver the specified number of copies to the designated parties. Certificates of inspection, testing or approval required by public authorities shall be secured by the Contractor and promptly delivered by him to the Owner, in adequate time to avoid delays in the Work or final payment therefore.

7.6.5 If the Design Consultant or the Owner is to observe the inspections, tests or approvals required by the Contract Documents, laws, ordinances, rules, regulations, or order of any public authority having jurisdiction or that are required to establish compliance with the Contract Documents, he will do so promptly and, where practicable, at the normal place of testing.

7.6.6 The Contractor shall pay for and have sole responsibility for inspections or testing performed exclusively for his own convenience.

7.7 UNENFORCEABILITY OF ANY PROVISION

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

7.8 ATTORNEYS' FEES AND OTHER EXPENSES

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

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

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

ARTICLE 8

TIME

8.1 DEFINITIONS

- 8.1.1 Unless otherwise provided, the Contract Time is the period of time allotted in the Contract Documents for Final Completion of the Work as defined in Paragraph 8.1.4, including authorized adjustments thereto. The Contractor shall achieve Final Completion within the Contract Time.
- 8.1.2 The date of commencement of the Work is the date established in the Notice to Proceed. If there is no Notice to Proceed, it shall be the date of the Owner-Contractor Agreement or such other date as may be established therein. The Contractor shall not commence work or store materials or equipment on site until written Notice to Proceed is issued or until the Contractor otherwise receives the Owner's written consent.
- 8.1.3 The date of Substantial Completion of the Work or designated portion thereof is the date certified by the Design Consultant and the Owner when the Work or a designated portion thereof is sufficiently complete, in accordance with the Contract Documents, so the Owner can fully and legally occupy and utilize the Work or designated portion thereof for the use for which it is intended, with all of the parts and systems operable as required by the Contract Documents, including a preliminary test and balance report for the mechanical system. Only incidental corrective work and any final cleaning beyond that needed for the Owner's full use may remain for Final Completion. The Contractor acknowledges and agrees that the intercom, telephone, data security, building automation system (including functional graphics at the site), MATV, and other educational operational systems are required for the Owner's use of the building for its intended purpose. The Contractor shall provide operation and maintenance manuals to the Owner as required by the Contract Documents prior to Substantial Completion and shall provide the required training on the operation of the equipment and systems within two weeks of Substantial Completion. The Contractor shall achieve Substantial Completion by the date specified in the Supplemental Conditions including authorized adjustments thereto. The Owner's occupancy of incomplete work shall not alter the Contractor's responsibilities pursuant to this paragraph. Only incidental corrective work and any final cleaning beyond that needed for the Owner's full use may remain for Final Completion. The issuance of a temporary or final certificate of occupancy shall not, in itself, constitute Substantial Completion.
- 8.1.4 Final Completion of the Work occurs on the date certified by the Design Consultant and the Owner when the Work is totally complete, to include punch list work, in accordance with the Contract Documents and the Owner may fully occupy and utilize the Work for the use for which it is intended. The issuance of a temporary or final certificate of occupancy shall not, in itself, constitute Final Completion.
- 8.1.5 The term Day as used in the Contract Documents shall mean calendar day unless otherwise specifically designated. All dates shall mean midnight of the indicated day unless otherwise stipulated.
- 8.1.6 Completion Dates shall mean the dates set forth in the Supplemental Conditions for Substantial Completion and Final Completion.

8.2 PROGRESS AND COMPLETION

- 8.2.1 All time limits stated in the Contract Documents are of the essence of the Contract with respect to the Contractor's performance.

8.2.2 The Contractor shall begin the Work on the date of commencement as defined in Paragraph 8.1.2. He shall carry the Work forward expeditiously with adequate forces and shall achieve Substantial Completion and Final Completion within the time frames stated in the Contract Documents.

8.2.3 Attention is directed to the fact that the Work is urgently needed by the Owner; for this reason, it shall be agreed that the Contractor and its Subcontractors will achieve Substantial Completion of the Work under the Contract within the time established under Paragraph 8.2.4 of the Supplemental Conditions after award of Contract, or Notice to Proceed, and that he will achieve Final Completion of the Work in all its details for final acceptance within the time established under Paragraph 8.2.4 of the Supplemental Conditions.

8.3 DELAYS AND EXTENSIONS OF TIME

8.3.1 The time during which the Contractor or any of the Subcontractors is delayed in the performance of the Work by the issuance of any required permits, acts of god, excessive inclement weather, fires, floods, epidemics, quarantine restrictions, strikes, riots, civil commotions or freight embargoes, or other conditions beyond the Contractor's or the Subcontractors' control and which the Contractor or the Subcontractors could not reasonably have foreseen and provided against, except for delays caused solely by the Owner, Design Consultant or their consultants, shall be added to the time for completion of the Work stated in the Contract. Neither the Owner nor the Design Consultant shall be obligated or liable to the Contractor or the Subcontractors for indirect or direct damages, costs or expenses of any nature which the Contractor, the Subcontractors, or any other person may incur as a result of any of the delays, interferences, changes in sequence in the Work included in this Section 8.3.1. The Contractor hereby expressly waives any Claims against the Owner and the Design Consultant on account of any indirect or direct damages, lost profits, costs or expenses of any nature which the Contractor, the Subcontractors or any other person may incur as a result of any delays, interferences, changes in sequence or the like, and it is understood and agreed that the Contractor's sole and exclusive remedy in any such events shall be an extension of the Contract time in accordance with the Contract Documents.

8.3.2 In the event Project delays arise from or out of any act or omission of the Owner, Design Consultant or their consultants, the time during which the Project is delayed shall be added to the Contract and the Contractor may be reimbursed for its direct Project damages, excluding general overhead expenses and indirect costs, if the Contractor strictly complies with this Article 8.3. Notwithstanding the previous sentence, if the Contractor or Subcontractor in any way shares in responsibility for the delay, neither the Owner nor the Design Consultant shall be obligated or liable to the Contractor or the Subcontractors for indirect or direct damages, costs or expenses of any nature which the Contractor, the Subcontractors, or any other person may incur as a result of any of the delays, interferences, changes in sequence of the Work, and the Contractor's sole remedy, if any, shall be an extension of the Contract time.

8.3.3 In the event Project delays arise solely from or out of any act or omission of the Contractor, Subcontractors or their agents, the Contractor shall not be entitled to extension of the Contract time and shall be subject to the payment of Liquidated Damages as provided in this Contract.

8.3.4 The Contract time shall be adjusted only for changes pursuant to section 12.1, suspension of the Work pursuant to paragraph 3.3.2 or paragraph 3.3.3, and excusable delays pursuant to paragraph 8.3.4. In the event the Contractor requests an extension of the Contract time or files a Claim related to any form of delay, it shall furnish such justification and supporting evidence as the Owner may deem necessary for a determination of whether or not the Contractor is entitled

to an extension of time under the provisions of the Contract, and shall further conform to all of the requirements of the specifications, Section 013200, construction schedules and reports. The burden of proof to substantiate a Claim shall rest with the Contractor, including evidence that the cause was beyond its control. The Owner shall base its findings of fact and decision on such justification and supporting evidence, including a finding that the alleged delay impacted the Project's critical path, and shall advise the Contractor in writing thereof. If the Owner finds that the Contractor is entitled to any extension of the Contract time, the Owner's determination of the total number of days of extension shall be based upon the currently approved progress schedule and on all data relevant to the extension. Such data will be incorporated into the schedule in the form of a revision thereto, accomplished in a timely manner. The Contractor acknowledges and agrees that actual delays (due to said changes, suspension of Work or excusable delays) in activities which, according to the schedule, do not affect the Contract time, do not have any effect upon the Contract time and therefore will not be the basis for a change therein. The Contractor acknowledges and agrees that time extensions will be granted only to the extent that excusable delays exceed the available float in the critical path activities in the Contractor's currently approved schedule.

- 8.3.4.1 Extensions in the Contract time by Change Orders are subject to extension-in-time audit by the Owner as follows:
 - 8.3.4.1.1 The Contractor agrees that, even though the Owner, Contractor and Design Consultant have previously signed a Change Order containing an extension-in-time resulting from a change in or addition to the Work that said extension in the Contract time may be adjusted by an audit after the fact by the Owner. If such an audit is to be made, the Owner must undertake the audit and make a ruling within thirty (30) days after the completion of the Work under the Change Order.
 - 8.3.4.1.2 The Contractor agrees that any extension of the Contract time to which it is entitled arising out of a Change Order undertaken on a force accounting (labor and materials) basis, shall be determined by an extension-in-time audit by the Owner after the Work of the Change Order is completed. Such rulings shall be made by the Owner within thirty (30) days after a request for same is made by the Contractor or Design Consultant, except said thirty (30) days will not start until the Work under the Change Order is completed.
 - 8.3.4.1.3 Should a time extension be granted for Substantial Completion the date for Final Completion shall be appropriately adjusted unless specifically stated otherwise.
- 8.3.4.2 Subject to other provisions of the Contract, the Contractor may be entitled to an extension of the Contract time (but no increase in the Contract sum) for delays arising from unforeseeable causes beyond the control and without the fault or negligence of the Contractor, the Subcontractors or suppliers as follows:
 - 8.3.4.2.1 Labor disputes and strikes (including strikes affecting transportation), that do, in fact, directly delay the progress of the Work on the critical path; however, an extension of Contract time on account of an individual labor strike shall not exceed the number of days of said strike;
 - 8.3.4.2.2 Acts of nature: tornado, fire, hurricane, blizzard, earthquake, or flood that damage Work in place or stored materials or adversely impact the schedule's critical path;
 - 8.3.4.2.3 Excessive inclement weather; however, the Contract time will not be extended due to reasonably anticipated inclement weather or for delays in the aftermath of inclement weather, reasonably anticipated or excessive. The time for performance of this Contract, as stated in the Contract

- 8.3.5 If the Contractor shall neglect, fail or refuse to complete the Work within the time herein specified, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as a part consideration for the awarding of this Contract, to pay the Owner the amount specified in the Contract, not as a penalty but as Liquidated Damages for such breach of Contract as hereinafter set forth, for each and every calendar day that the Contractor shall be in default after the time stipulated in the Contract for completing the Work. The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is agreed to be the amount of damages which the Owner would sustain and said amount shall be retained from time to time by the Owner from current periodical estimates.
- 8.3.6 The Contractor and the Subcontractors shall not be entitled to and hereby expressly waive any extension of time resulting from any condition or cause unless said Claim for extensions of time is made in writing to the Owner within ten (10) days of the first instance of delay for all delays, except excessive inclement weather which shall be made in writing to the Owner within forty-five (45) days after the date the structure is enclosed. Circumstances and activities leading to such Claim shall be indicated or referenced in a daily field inspection report for the day(s) affected. In every such written Claim, the Contractor shall provide the following information:
- 8.3.6.1 Nature of the delay;
- 8.3.6.2 Date (or anticipated date) of commencement of delay;
- 8.3.6.3 Activities on the progress schedule affected by the delay, and/or new activities created by the delay and their relationship with existing activities;
- 8.3.6.4 Identification of person(s) or organization(s) or event(s) responsible for the delay;
- 8.3.6.5 Anticipated extent of the delay; and
- 8.3.6.6 Recommended action to avoid or minimize the delay.
- 8.3.7 If no schedule or agreement is made stating the dates upon which written interpretations as set forth in Section 2.2 shall be furnished, then no Claim for delay shall be allowed on account of failure to furnish such interpretations until twenty (20) days after request is made for them, and not then unless such Claim is reasonable.
- 8.3.8 No Claim by the Contractor for an extension of time for delays will be considered unless made in strict compliance with the requirements of this Article. All Claims not filed in accordance with this paragraph shall be waived by the Contractor.
- 8.4 **RESPONSIBILITY FOR COMPLETION**
- 8.4.1 The Contractor shall be responsible for completion in accordance with Paragraph 4.12.1.
- 8.4.2 The Owner may require the Contractor to submit a recovery schedule in accordance with Specifications, Section 013200, Construction Schedules and Reports demonstrating his program and proposed plan to make up the lag in scheduled progress and to ensure completion of the Work within the Contract Time. If the Owner finds the proposed plan not acceptable, he may require the Contractor to submit a new plan. If the actions taken by the Contractor or the second

plan proposed are not satisfactory, the Owner may require the Contractor to take any of the actions set forth in Paragraph 4.12.2 without additional cost to the Owner, to make up the lag in scheduled progress.

8.4.3 Failure of the Contractor to substantially comply with the requirements of this Section 8.4 may be considered grounds for a determination by the Owner, pursuant to Section 14.3, that the Contractor is failing to prosecute the Work with sufficient diligence to ensure its completion within the Contract Time.

8.5 LIQUIDATED DAMAGES FOR DELAY

8.5.1 Owner and Contractor agree that the damages incurred by the Owner due to the Contractor's failure to achieve Substantial Completion by the date specified in the Supplemental Conditions for Substantial Completion, including any extensions thereof, shall be in the amounts set forth in the Supplemental Conditions, for each consecutive day beyond the date of Substantial Completion that Contractor achieves Substantial Completion, and that the damages incurred by the Owner due to the Contractor's failure to achieve Final Completion by the date specified in the Supplemental Conditions for Final Completion, including any extensions thereof, shall be in the amount set forth in the Supplemental Conditions for each consecutive day beyond the date of Final Completion that Contractor achieves Final Completion. The Liquidated Damages are a reasonable estimate by Contractor and Owner of the damages to be suffered by Owner and are not to be construed as a penalty, it being recognized by the Owner and the Contractor that the injury to the Owner which could result from a failure of the Contractor to complete on schedule is uncertain and cannot be computed exactly or that it would be unreasonably expensive for Owner to calculate its damages exactly.

8.5.2 The amount specified for Substantial Completion is the minimum measure of damages the Owner will sustain due to delay in the completion of the Work, which shall include, but not be limited to the loss of use of the facilities, the relocation of students and services, the cost of the Owner's time and resources, damage to the Owner's reputation, and storage of furniture and other materials. The amount specified for Final Completion is a reasonable and proper measure of the damages the Owner will sustain due to the delay in the completion of remedial work. This amount includes the disruption to the school and the learning environment, the cost of the Owners time and resources, damage to the Owner's reputation, and the inability to fully use the facilities. The inability of the Owner to quantify actual damages shall not prevent the recovery of Liquidated Damages.

8.5.3 Notwithstanding any other provisions of these General Conditions, if there is concurrent delay in the completion of the Work, the Contractor shall be liable for Liquidated Damages as specified in the General Conditions and Supplemental Conditions during such period of concurrent delay. For the purpose of this Paragraph, concurrent delay means (a) a delay event caused in part by the Owner or its agent and in part by the Contractor or its agents, Subcontractors or Sub-subcontractors, or (b) one or more delay event caused solely by the Owner, its agents, or the Design Consultant, and one or more delay event caused in part by the Contractor, its agents, Subcontractors or Sub-subcontractors, each of which would have resulted in a delay without the other and which delays run concurrently, or at the same time. In the event that the foregoing provision making the Contractor liable for Liquidated Damages during a period of concurrent delay is found to be unenforceable, then the parties agree that in the event of a concurrent delay, the extent of the delay will be apportioned between the Owner and the Contractor, and the Contractor will be responsible for Liquidated Damages as set forth in the General Conditions and Supplemental Conditions for those portions of the delay which are

apportioned to the Contractor, its agent, Subcontractors, Sub-subcontractors, or Material Suppliers.

- 8.5.4 The provisions for Liquidated Damages do not bar or limit Owner's other rights and remedies against Contractor, for damages other than for failure to achieve the Substantial Completion date or the Final Completion date as required. The amount of Liquidated Damages set forth in Section 8.5 shall not include additional legal or design professional costs that may result from the Contractor's default. If such legal or design professional costs are incurred by the Owner, the Contractor shall be liable to the Owner for those costs in addition to the Liquidated Damages amount set forth in Section 8.5.
- 8.5.5 The Liquidated Damages assessed for failure to meet Substantial Completion by the specified date and the Liquidated Damages assessed for failure to meet Final Completion by the specified date shall be assessed cumulatively.

ARTICLE 9

PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

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

9.2 SCHEDULE OF VALUES

- 9.2.1 Before the first Application for Payment, the Contractor shall submit to the Owner a schedule of values allocated to the various portions of the Work, as set forth in the Specifications, Section 013200, Construction Schedules and Reports, and supported by such data to substantiate its accuracy as the Owner may require. This schedule, unless objected to by the Owner, shall be used as a basis for the Contractor's Applications for Payment and only for this purpose. If approved by the Owner, the Contractor may include in his schedule of values a line item for mobilization which shall include a reasonable amount of mobilization for the Contractor and his Subcontractors. The Contractor shall not front-end load his schedule of values.

9.3 APPLICATIONS FOR PAYMENT

- 9.3.1 Prior to the date for each progress payment established in the Owner-Contractor Agreement, the Contractor, in accordance with the Specifications, Section 013200, Construction Schedules and Reports, shall submit to the Design Consultant an itemized Application for Payment, notarized if required, supported by such data substantiating the Contractor's right to payment as the Design Consultant and the Owner may require, including but not limited to the Contractor's certification that all work for which payment is requested has been completed in full in accordance with the Contract Documents, and reflecting retainage, if any, as provided elsewhere in the Contract Documents. If requested by the Owner, the Contractor shall also certify that he has paid all due and payable amounts for which previous Applications for Payment were issued and payments received from the Owner, by providing waivers of liens for said payments.

- 9.3.1.1 The Contractor shall submit with the Application for Payment a list of those Historically

Underutilized Businesses (HUB's) Subcontractors whose work is included in the application and the amount due each. In addition, the Historically Underutilized Business (HUB) must itself perform satisfactory work or services or provide supplies under the Contract and not act as a mere conduit.

- 9.3.2 The Owner will withhold retainage from Contractor on all Applications for Payment to the maximum extent and in the maximum amount allowed by law (currently codified at N.C.G.S. 143-134.1) and in accordance with that statute or applicable successor statute. In the event that N.C.G.S 143-134.1 or applicable successor statute are not in effect or do not apply at the time the Contract is executed, Owner will retain ten percent (10%) of the amount of each Application for Payment from the Contractor as retainage, until Contractor achieves Final Completion, whether or not the Owner has occupied any or all of the Project before such time. However, if the Owner, at any time after fifty percent (50%) of the Work has been completed, finds that satisfactory progress is being made, he may authorize payment to the Contractor in full of each Progress Payment for work performed beyond the fifty percent (50%) stage of completion. If a reduction in retainage has been made, the Owner may increase the retainage back to original percentage at any time if the Owner concludes that the Contractor is not progressing with the Work in a timely or satisfactory manner.
- 9.3.3 Payments may be made by the Owner, at its sole discretion, on account of materials or equipment not incorporated in the work but delivered and suitably stored at the site or in a bonded warehouse by the Contractor. Payments for materials or equipment stored shall only be considered upon submission by the Contractor of satisfactory evidence (for example, releases or paid invoices from the seller) that the Contractor has acquired title to such material, that it will be utilized on the work under this Contract and that it is satisfactorily stored, protected, and insured or that other procedures satisfactory to the Owner that will protect the Owner's interests have been taken. In the event the materials are stored in a bonded warehouse that is not located in the county of the project, the Contractor shall reimburse the travel cost and hourly billing expenses incurred by the Design Consultant for travel to view and assess whether the materials meet the requirements of the Contract Documents. Materials once paid for by the Owner become the property of the Owner and may not be removed from the work site or bonded warehouse, other than to be delivered from the warehouse to the site, without the Owner's written permission. Responsibility for such stored materials and equipment shall remain with the Contractor regardless of ownership.
- 9.3.3.1 Owner will not make payment to the Contractor on account of materials or equipment not incorporated in the Work but delivered and stored at the site if the Contractor, in his schedule of values, does not include line items for such delivered and stored materials or equipment.
- 9.3.3.2 It is specifically understood and agreed that an inspection and approval of the materials by the Owner, the Design Consultant or any agency retained by any of them shall not in any way subject the Owner to pay for the said materials or any portion thereof, even though incorporated in the Work, if said materials shall in fact turn out to be unfit to be used in the Work, nor shall such inspection be considered as any waiver of objection to the Work on account of the unsoundness or imperfection of the material used.
- 9.3.4 The Contractor warrants that title to all work, materials and equipment covered by an Application for Payment will pass to the Owner either by incorporation in the construction or upon the receipt of payment by the Contractor, whichever occurs first, free and clear of all liens, claims, security interests or encumbrances, hereinafter referred to in this Article 9 as "liens"; and that no work, materials or equipment covered by an Application for Payment will have been acquired by the Contractor, or by any other person performing work at the site or furnishing

materials and equipment for the Project, subject to an agreement under which an interest therein or an encumbrance thereon is retained by the seller or otherwise imposed by the Contractor or such other person.

- 9.3.5 The Contractor shall submit with the Application for Payment a notarized Contractor's Sales Tax Report of N.C. State and County sales taxes paid during the payment period with respect to building materials, supplies, fixtures, and equipment that have become a part of, or annexed to, a building or structure erected, altered or repaired for the Owner. The Sales Tax Report shall include the vendor from whom the property was purchased, the dates and number of invoices covering the purchase, the total amount of the invoices of each vendor, the North Carolina State and County sales and use tax paid thereof, and the cost of the property withdrawn from the warehouse stock and North Carolina sales or use taxes paid thereof. Items that should not be included are: scaffolding, forms for concrete, fuel for operation of machinery and equipment, tools, equipment, equipment repair parts and equipment rentals.
- 9.3.6 Unless an interest rate is required by law, Owner shall not pay any interest on an amount owed to Contractor. No interest shall accrue on amounts Owner is authorized by law or by the Contract to withhold or backcharge to Contractor.

9.4 CERTIFICATION OF PAYMENT

- 9.4.1 The Design Consultant will, after receipt of the Contractor's Application for Payment either issue a Certification of Payment to the Owner, with a copy to the Contractor, for such amount as the Design Consultant determines is properly due, or notify the Contractor in writing of their reasons for withholding a Certification as provided in Paragraph 9.6.1.
- 9.4.2 The submission and approval of the progress schedule and monthly updates thereof as required by the Specifications, Section 013200, Construction Schedules and Reports, shall be an integral part and basic element of the application upon which progress payment shall be made. The Contractor shall be entitled to progress payments only as determined from the currently approved and updated schedule.
- 9.4.3 The signing of a Certification of Payment will constitute a representation by the Design Consultant to the Owner, based on their observations at the site pursuant to their agreements with the Owner, and the data comprising the Application for Payment, that the Work has progressed to the point indicated; that, to the best of their knowledge, information and belief, the quality of the Work is in accordance with the Contract Documents (subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to the results of any subsequent tests required by or performed under the Contract Documents, to minor deviations from the Contract Documents correctable prior to completion, and to any specific qualifications stated in their Certification); and that the Contractor is entitled to payment in the amount certified. However, by signing a Certification of Payment, the Design Consultant shall not thereby be deemed to represent that it has made exhaustive or continuous on-site inspections to check the quality or quantity of the Work or that it has reviewed the construction means, methods, techniques, sequences, or procedures, or that it has made any examination to ascertain how or for what purpose the Contractor has used the moneys previously paid on account of the Contract Sum.

9.5 PROGRESS PAYMENTS

- 9.5.1 After a Certification of Payment has been issued, the Owner shall make payment in the manner and within the time provided in the Contract Documents, unless Contractor is in breach of the

Contract or otherwise owes the Owner, in which case Owner may withhold an appropriate amount.

- 9.5.2 The Contractor shall promptly pay each Subcontractor (including suppliers, laborers, and material-men) performing labor or furnishing material or equipment for the Work, upon receipt of payment from the Owner, out of the amount paid to the Contractor on account of such Subcontractor's work, the amount to which said Subcontractor is entitled, reflecting the percentage actually retained, if any, from payments to the Contractor on account of such Subcontractor's work. The Contractor shall, by an appropriate agreement with each Subcontractor, also require each Subcontractor to make payments to his Sub-subcontractors in similar manner. The Owner may at any time require proof of payment to a Subcontractor or Sub-subcontractor for work paid by the Owner. Notwithstanding any other provision of the General Conditions, no Contractor, Subcontractor, Sub-subcontractor or Material Supplier shall have any Claim against the Owner, by virtue of the Contract, under any theory, including breach of contract, or third party beneficiary. The Owner shall not be in privity of any contract with any Subcontractor, Sub-subcontractor or Material Supplier pertaining to the Work, the Project and these General Conditions. Also, neither the Contractor, or any Subcontractor or Sub-subcontractor shall have any right to assert a lien on Owner's real property or on any funds held by Owner.
- 9.5.3 The Owner may, on request and at his discretion, furnish to any Subcontractor, if practicable, information regarding the percentages of completion or the amounts applied for by the Contractor and the action taken thereon by the Design Consultant on account of work done by such Subcontractor.
- 9.5.4 Neither the Owner nor the Design Consultant shall have any obligation to pay or to see to the payment of any moneys to any Subcontractor except as may otherwise be required by law.
- 9.5.5 No Certification for a progress payment, nor any progress payment or final payment, nor any partial or entire use or occupancy of the Project by the Owner, shall constitute an acceptance of any Work not in accordance with the Contract Documents.
- 9.5.6 The Contractor agrees to keep the Work and the site of the Project free and clear of all liens related to labor and materials furnished in connection with the Work. Furthermore, pursuant to and in compliance with requirements of Paragraph 9.3.4, the Contractor waives any right he may have to file any type of lien in connection with the Work. Notwithstanding anything to the contrary contained in the Contract Documents, if any such lien is filed or there is evidence to believe that any lien may be filed at any time during the progress of the Work or within the duration of this Contract, the Owner may refuse to make any payment otherwise due the Contractor or may withhold from any payment due the Contractor a sum sufficient in the opinion of the Owner to pay all obligations and expenses necessary to satisfy such lien or the underlying claim represented by such lien. The Owner may withhold such payment unless or until the Contractor, within ten (10) days after demand thereof by the Owner, shall furnish satisfactory evidence that the indebtedness and any lien in respect thereof has been satisfied, discharged and released of record, or that the Contractor has legally caused such lien to be released of record pending the resolution of any dispute between the Contractor and the person or persons filing such lien. If the Contractor shall fail to furnish such satisfactory evidence within ten (10) days of the demand thereof, the Owner may discharge such indebtedness and deduct the amount thereof, together with any and all losses, costs, damages and attorney's fees suffered or incurred by the Owner from any sum payable to the Contractor under the Contract Documents, including but not limited to final payment and retained percentage. This Paragraph 9.5.6 shall be specifically included in all Subcontracts and purchase orders entered into by the Contractor.

Notwithstanding any other provision of the Contract, nothing in the Contract shall affect the rights of Subcontractors, Sub-subcontractors, Material Suppliers and Vendors from enforcing any lien rights they have against parties other than the Owner.

9.6 PAYMENTS WITHHELD

9.6.1 The Design Consultant may decline to certify payment and may withhold their Certification of Payment in whole or in part, to the extent necessary to reasonably protect the Owner, if in the Design Consultant's opinion it is unable to make representations to the Owner as provided in Paragraph 9.4.3. If the Design Consultant is unable to make representations to the Owner as provided in Paragraph 9.4.3 and to certify payment in the amount of the Application for Payment, it will notify the Contractor as provided in Paragraph 9.4.1. If the Contractor and the Design Consultant cannot agree on a revised amount, the Design Consultant will promptly issue a Certification of Payment for the amount for which it is able to make such representations to the Owner. The Design Consultant may also decline to certify payment because of subsequently discovered evidence or subsequent observations that may nullify the whole or any part of any Certification of Payment previously issued to such extent as may be necessary in its opinion to protect the Owner from loss, because of:

- .1 Defective Work not remedied,
- .2 Third party claims filed, whether in court, in arbitration or otherwise, or reasonable evidence indicating probable filing of such claims,
- .3 Failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment,
- .4 Reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum,
- .5 Damage to the Owner or another contractor,
- .6 Reasonable evidence that Contractor will not achieve Substantial Completion and/or Final Completion by the dates specified in the Supplemental Conditions.
- .7 Failure or refusal of the Contractor to carry out the Work in accordance with or to otherwise substantially or materially comply with the Contract Documents,
- .8 Liens filed or reasonable evidence that a lien may be filed for any portion of the Work,
- .9 Failure or refusal of the Contractor to properly schedule and coordinate the Work, to provide progress schedules, reports and updates, or to otherwise fully comply with the Specifications, Section 013200, Construction Schedules and Reports,
- .10 Failure or refusal of the Contractor to fully comply with the provisions of Section 6.2 requiring the Contractor to direct certain Claims to Separate Contractors and to defend and indemnify the Owner and/or the Design Consultant in the event Separate Contractors file certain Claims, or
- .11 Failure or refusal of the Contractor to submit the required information on Historically Underutilized Businesses (HUB's)

- .12 Failure or refusal of the Contractor to submit a notarized North Carolina State and County Sales Tax Report.
 - .13 Any other breach of the Contract by Contractor which has or is likely to cause monetary damages or loss to Owner.
 - .14 Any other reason authorized by the Contract Documents or by law.
- 9.6.2 When the above grounds in Paragraph 9.6.1 are removed to the Design Consultant's and Owner's satisfaction, payment shall be made for amounts withheld because of them.
- 9.7 FAILURE OF PAYMENT
- 9.7.1 If the Owner does not make payment to the Contractor within the forty-five (45) calendar days after receipt of the Contractor's approved Application for Payment from the Design Consultant through no fault of the Contractor, and the Owner otherwise not being entitled under the Contract Documents or applicable law to withhold payment, then the Contractor may, upon seven (7) additional days' Notice to the Owner, stop the Work until payment of the amount owed according to the Contract Documents has been received. In such event, the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, which shall be effected by appropriate Change Order as provided herein.
- 9.8 SUBSTANTIAL COMPLETION
- 9.8.1 When the Contractor considers that the Work, or a designated portion thereof which is acceptable to the Owner, is substantially complete as defined in Paragraph 8.1.3, the Contractor shall prepare for submission to the Owner a list of items which in his opinion are to be completed or corrected and shall request in writing that the Design Consultant and the Owner perform a Substantial Completion inspection. The Design Consultant and the Owner shall review the Contractor's list and shall compile a punch list of items to be corrected and completed. The failure to include any items on such list does not alter the responsibility of the Contractor to complete the Work in accordance with the Contract Documents. When the Design Consultant and the Owner on the basis of an inspection jointly determine that the Work or designated portion thereof is substantially complete, they will then prepare a Certificate of Substantial Completion which shall establish the date of Substantial Completion, shall state the responsibilities of the Owner and the Contractor for security, maintenance, heat, utilities, damage to the Work, and insurance, and shall fix the time within which the Contractor shall complete the items listed therein. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion. The Certificate of Substantial Completion shall be submitted to the Owner and the Contractor for their written acceptance of the responsibilities assigned to them in such Certificate.
- 9.8.2 Upon Substantial Completion of the Work or designated portion thereof and upon application by the Contractor and certification by the Design Consultant, the Owner shall make payment, except retainage held pursuant to Paragraph 9.3.2, for such work or portion thereof, as provided in the Contract Documents unless Contractor is in breach of the Contract in which case Owner may withhold an appropriate amount.
- 9.8.3 The acceptance of Substantial Completion payment shall constitute a waiver of all Claims by the Contractor and its Subcontractors and Sub-subcontractors except those previously made in writing and identified by the Contractor as unsettled at the time the Contractor submits the

Application for Payment for Substantial Completion, and except for the retainage sums due at Final Completion. The Contractor shall indemnify and hold the Owner harmless against any Claims by its Subcontractors and Sub-subcontractors that are waived because they were not made in writing and identified by the Contractor as unsettled when the Contractor submitted the Application for Payment for Substantial Completion.

- 9.8.4 The Owner shall have the option to correct or conclude any and all punch list items not completed by the Contractor to the satisfaction of the Design Consultant and the Owner within thirty (30) days from the actual date of Substantial Completion by utilizing its own forces or by hiring others. The cost of such correction of remaining punch list items by the Owner or others shall be deducted from the final payment to the Contractor. If Contractor does not complete certain punch list items within this time period, specified in Paragraph 9.8.4, all warranties and guarantees for such incomplete punch list items shall become effective upon issuance of final payment for the Project. Paragraph 9.8.4 does not limit the Liquidated Damages provisions related to failure to reach Final Completion by the date stipulated in the Contract Documents.
- 9.8.5 The issuance of the Certificate of Substantial Completion does not indicate final acceptance of the Project by the Owner, and the Contractor is not relieved of any responsibility for the Project except as specifically stated in the Certificate of Substantial Completion.
- 9.8.6 Should the Design Consultant and the Owner determine that the Work or a designated portion thereof is not substantially complete, they shall inform the Contractor in writing stating why the Project or designated portion is not substantially complete. The Contractor shall expeditiously complete the Work and shall re-request in writing that the Design Consultant and the Owner perform a Substantial Completion inspection. Costs, if any, associated with such inspection shall be assessed to the Contractor.
- 9.8.7 Certificate of Substantial Completion will not be issued until the following is completed by Contractor:
- .1 Submit Contractor's list of work not yet complete with proposed time for completion signed by Contractor's project superintendent;
 - .2 Submit Certificate of Occupancy;
 - .3 Submit record drawings, maintenance manuals, final project photos, property surveys;
 - .4 Deliver tools, spare parts, extra stock and similar items;
 - .5 Submit warranties, bonds, maintenance agreements and final certifications;
 - .6 Complete start-up testing of all systems and instruction of the Owner's personnel;
 - .7 Coordinate and complete final changeover of permanent locks and transmit keys to Owner;
 - .8 Discontinue and remove temporary facilities from the site;
 - .9 Complete final cleaning;
 - .10 Advise the Owner of pending insurance changeover requirements;
 - .11 Coordinate and complete changeover of security, telephone, cable and other services; and

- .12 Submit pay application showing 100% complete for work claimed to be substantially complete.

9.9 FINAL COMPLETION AND FINAL PAYMENT

9.9.1 Upon receipt of the documentation required by Section 9.8, and of written Notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Design Consultant and the Owner will promptly make such inspection and, when they find the Work acceptable under the Contract Documents and the Contract fully performed, the Design Consultant shall issue a final Certification of Payment stating that to the best of their knowledge, information and belief, and on the basis of their observations and inspections, the Work has been completed in accordance with the terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor, and noted in said final Certification, is due and payable. The final Certification of Payment will constitute a further representation that the conditions precedent to the Contractor's being entitled to final payment as set forth in Section 9.8 have been fulfilled. Payment shall be made in full to the Contractor within forty five (45) calendar days after receipt by the Owner of the final Certification of Payment provided that the requirements of Article 9 have been fulfilled, except for an amount mutually agreed upon for any Work remaining incomplete or uncorrected for which the Owner is entitled a credit under the Contract Documents.

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

- .1 An affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or his property might in any way be responsible, have been paid or otherwise satisfied;
- .2 Consent of Surety to final payment;
- .3 If required by the Owner, other data establishing payment or satisfaction of all such obligations, such as receipts, releases and waivers of liens arising out of the Contract, to the extent and in such form as may be designated by the Owner; and
- .4 A written certification that:
 - .1 The Contractor has reviewed the requirements of the Contract Documents,
 - .2 The Work has been inspected by the Contractor for compliance with all requirements of the Contract Documents,
 - .3 Pursuant to this inspection, the Contractor certifies and represents that the Work complies in all respects with the requirements of the Contract Documents,
 - .4 The Contractor further certifies and represents that all equipment and systems have been installed in accordance with the Contract Documents and have been tested in accordance with the Specification requirements and are operational, and
 - .5 The Contractor hereby certifies and represents that the Work is complete in all respects and ready for final inspection.

- 9.9.3 If any Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify him against any loss. If any such lien or claim remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all moneys that the latter may be compelled to pay in discharging such lien or claims, including all costs and reasonable attorney's fees. The Owner may withhold from the final payment any sum that the Owner has reason to believe may be needed to satisfy any lien, claim or threat of lien arising from the Work. The Owner may deduct from the final payment an amount equal to any costs, expenses and attorney's fees incurred by the Owner in removing or discharging any liens or claim arising from the Work.
- 9.9.4 If, after Substantial Completion of the Work, Final Completion thereof is materially delayed through no fault of the Contractor or by the issuance of Change Orders affecting Final Completion, and the Owner so confirms, the Owner shall, upon application by the Contractor and certification by the Design Consultant, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for the portion of the Work not fully completed or corrected is less than the retainage stipulated in the Contract Documents, and if bonds have been furnished as provided in Section 7.4, the written consent of the Surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Design Consultant prior to certification of such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.
- 9.9.5 The making of final payment shall constitute a waiver of all Claims by the Owner against the Contractor except those arising from:
- .1 Unsettled liens, and claims against the Owner or the Design Consultant, or their employees, agents, or representatives;
 - .2 Faulty, defective or non-conforming Work;
 - .3 Failure of the Work to comply with the requirements of the Contract Documents;
 - .4 Terms of any warranties contained in or required by the Contract Documents;
 - .5 Damages incurred by the Owner resulting from lawsuits brought against the Owner, the Design Consultant, or their agents, employees or representatives because of failures or actions on the part of the Contractor, his Subcontractors, Sub-subcontractors, or any of their employees, agents or representatives;
 - .6 Fraud or bad faith committed by the Contractor or any Subcontractor or supplier during performance of the Work but discovered by Owner after final payment; or
 - .7 Claims about which Owner did not have actual knowledge or which increase in scope or amount at the time of final payment.
- 9.9.6 The acceptance of final payment shall constitute a waiver of all Claims by the Contractor except those previously made in writing and identified by the Contractor as unsettled at the time of the final Application for Payment.
- 9.9.6.1 Notwithstanding any other provision of the Contract, Owner may withhold from Contractor payment otherwise due, as a result of any losses, expenses costs or damages suffered or anticipated to be suffered by Owner as a result of Contractor's breach of any provision of the

Contract, including but not limited to Liquidated Damages or backcharges against Contractor.

9.10 **OWNER'S RIGHT TO OCCUPY INCOMPLETE WORK**

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

9.10.2 If the Owner exercises his rights under the foregoing and occupies the full Project, then there shall be no Liquidated Damages on account of failure on the Contractor's part to reach Substantial Completion from that date forward. This provision does not affect, however, any Liquidated Damages that would be assessed for any period of time between the contractual date of Substantial Completion and the date of any such occupancy. Further, this provision would have no effect on Liquidated Damages assessed on account of late Final Completion.

ARTICLE 10

PROTECTION OF PERSONS AND PROPERTY

10.1 **SAFETY PRECAUTIONS AND PROGRAMS**

10.1.1 The Owner, the Design Consultant, or their agents, employees or representatives are not responsible for the means, methods, techniques, sequences or procedures utilized by the Contractor, or for safety precautions and programs in connection with the Work. The Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. This requirement applies continuously throughout the Contract performance, until final payment is made and all punch list and warranty work is performed properly, and is not limited to regular working hours.

10.2 **SAFETY OF PERSONS AND PROPERTY**

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

- .1 All employees on the Work and all other persons who may be affected thereby;
- .2 All the Work and all materials and equipment to be incorporated therein, whether in storage on or off the site, under the care, custody or control of the Contractor or any of his Subcontractors or Sub-subcontractors, machinery, equipment and all hazards shall be guarded or eliminated in accordance with all applicable safety regulations; and
- .3 Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and overhead or underground utilities not designated for removal, relocation or replacement in the course of construction.

- 10.2.2 The Contractor shall give all notices and comply with all applicable laws, ordinances, permits, rules, regulations and lawful orders of any public authority bearing on the safety or persons or property or their protection from damage, injury or loss.
- 10.2.2.1 The Contractor shall at all times safely guard the Owner's property from injury or losses in connection with the Contract. He shall at all times safely guard and protect his own work and adjacent property as provided by law and the Contract Documents, from damage. All passageways, guard fences, lights and other facilities required for protection by applicable safety regulations must be provided and maintained.
- 10.2.3 The Contractor shall erect and maintain, as required by existing conditions and progress of the Work, all reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent utilities.
- 10.2.4 When the use or storage of explosives or other hazardous materials or equipment is necessary for the execution of the Work, the Contractor shall exercise the utmost care and shall carry on such activities under the supervision of properly qualified personnel.
- 10.2.5 The Contractor shall promptly remedy at his own cost and expense all damage or loss to any property referred to in Subparagraphs 10.2.1.2 and 10.2.1.3 caused by the Contractor, any Subcontractor, any Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable and for which the Contractor is responsible under Subparagraphs 10.2.1.2 and 10.2.1.3, except damage or loss attributable solely to the acts or omissions of the Owner or Design Consultant or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to his obligations under Section 4.21. The Contractor shall perform such restoration by underpinning, repairing, rebuilding, replanting, or otherwise restoring as may be required or directed by the Owner, or shall make good such damage in a satisfactory and acceptable manner. In case of failure on the part of the Contractor to promptly restore such property or make good such damage, the Owner may, upon two (2) calendar days Notice, proceed to repair, rebuild or otherwise restore such property as may be necessary and the cost thereof, or a sum sufficient in the judgment of the Owner to reimburse the owners of property so damaged, will be deducted from any monies due or to become due the Contractor under the Contract.
- 10.2.6 The Contractor is responsible for the proper packing, shipping, handling and storage (including but not limited to shipment or storage at the proper temperature and humidity) of materials to be incorporated in the Work, so as to insure the preservation of the quality and fitness of the material for proper installation and incorporation in the Work, as required by the Contract Documents. For example, but not by way of limitation, Contractor shall, when necessary, place material on wooden platforms or other hard and clean surfaces and not on the ground and/or place such material under cover in any appropriate shelter or facility. Stored materials or equipment shall be located so as to facilitate proper inspection. Material and equipment which is delivered crated shall remain crated until ready for installation. Lawns, grass plots or other private property shall not be used for storage purposes without the written permission of the Owner or lessee unless otherwise within the terms of the easements obtained by the Owner.
- 10.2.6.1 It shall be the responsibility of the Contractor in his preparation of phasing schedule of work operations after consulting with the other Prime Contractors to designate areas in which each Prime Contractor may store materials. Areas designed shall meet with the approval of the

Design Consultant.

- 10.2.7 The Contractor shall give notice in writing at least forty eight (48) hours before breaking ground, to all persons, public utility companies, owners of property having structures or improvements in proximity to site of the Work, superintendents, inspectors, or those otherwise in charge of property, streets, water pipes, gas pipes, sewer pipes, telephone cables, electric cables, railroads or otherwise, who may be affected by the Contractor's operation, in order that they may remove any obstruction for which they are responsible and have representative on site to see that their property is properly protected. Such notice does not relieve the Contractor of responsibility for all damages, claims, or defense or indemnification of all actions against Owner resulting from performance of such work in connection with or arising out of Contract.
- 10.2.8 The Contractor shall investigate, locate, mark and protect all utilities encountered or to be encountered while performing the Work, whether indicated on the Drawings or not. The Contractor shall maintain utilities in service until moved or abandoned. The Contractor shall exercise due care when excavating around utilities and shall restore any damaged utilities to the same condition or better as existed prior to starting the Work, at no cost to the Owner. The Contractor shall maintain operating utilities or other services, even if they are shown to be abandoned on the Contract Drawings, in service until new facilities are provided, tested and ready for use.
- 10.2.9 The Contractor shall return all improvements on or about the site and adjacent property which are not shown to be altered, removed or otherwise changed to conditions which existed prior to starting the Work. The Contractor shall video record all areas or otherwise document the conditions existing at the site and in and around existing buildings prior to starting the Work. Submit documentation to the Design Consultant prior to beginning the Work.
- 10.2.10 The Contractor shall protect the Work, including but not limited to, the site, stored materials and equipment, excavations, and excavated or stockpiled soil or other material, intended for use in the Work, and shall take all necessary precautions to prevent or minimize damage to same or detrimental effect upon his performance or that of his Subcontractors, caused by or due to rain, snow, ice, run-off, floods, temperature, wind, dust, sand and flying debris; for example, but not by way of limitation, Contractor shall, when necessary, utilize temporary dikes, channels or pumping to carry-off divert or drain water, and shall as necessary tie-down or otherwise secure the Work and employ appropriate covers and screens.
- 10.2.11 The Contractor shall designate a responsible member of his organization at the site whose duty shall be the prevention of accidents and the protection of material, equipment and property. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner.
- 10.2.12 The Contractor shall not load or permit any part of the Work to be loaded so as to endanger its safety.
- 10.2.13 Notification to the Contractor by the Owner or the Design Consultant of a safety violation will in no way relieve the Contractor of sole and complete responsibility for the correctness of said violation or of sole liability for the consequences of said violation.
- 10.3 EMERGENCIES
- 10.3.1 In any emergency affecting the safety of persons or property, the Contractor shall act, at his discretion, to prevent threatened damage, injury or loss. The Contractor shall notify the Owner

of the situation and all actions taken immediately thereafter. If, in the opinion of the Contractor, immediate action is not required, the Contractor shall notify the Owner of the emergency situation and proceed in accordance with the Owner's instructions. Provided, however, if any loss, damage, injury or death occurs that could have been prevented by the Contractor's prompt and immediate action, the Contractor shall be fully liable for all costs, damages, claims, actions, suits, attorney's fees and all other expenses arising therefrom or relating thereto.

ARTICLE 11

INSURANCE

11.1 CONTRACTOR'S LIABILITY INSURANCE

11.1.1 The Contractor shall purchase and maintain in companies properly licensed by the Insurance Department of the State of North Carolina and acceptable to the Owner such insurance as will protect him, the Owner, and the Owner's agents, representatives, and employees from claims set forth below which may arise out of or result from the Contractor's operations under the Contract, whether such operations be by himself or by any Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- .1 Claims under workers' or workmen's compensation, disability benefit and other similar employee benefit acts (with Workmen's Compensation and Employer's Liability Insurance in amounts not less than those necessary to meet the statutory requirements of the state(s) having jurisdiction over any portion of the Work);
- .2 Claims for damages because of bodily injury, sickness or disease, or death of his employees; the Contractor will require his Subcontractors to similarly provide Workmen's Compensation Insurance for all of the latter's employees;
- .3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than his employees;
- .4 Claims for damages insured by usual personal injury liability coverage which are sustained (1) by any person as a result of an offense directly or indirectly related to the employment of such person by the Contractor, or (2) by any other person;
- .5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom; and
- .6 Claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

11.1.2 The insurance required by Paragraph 11.1.1 shall be primary and non-contributing to any insurance possessed or procured by the Owner, and limits of liability shall be not less than those set forth in these General Conditions of the Contract or required by law, whichever is greater.

11.1.3 The insurance required by the Contract shall include contractual liability insurance applicable to the Contractor's obligations under the Contract

11.1.4 Without limiting the above during the term of the Contract, the Contractor and each Subcontractor shall, at their own expense, purchase and maintain the following insurance with

companies properly licensed by the Insurance Department of the State of North Carolina and satisfactory to the Owner.

- .1 Worker's Compensation including Occupational Disease and Employer's Liability Insurance.
 - .1 Statutory - Amount and coverage as required by State of North Carolina Worker's Compensation laws.
 - .2 Employer's Liability
 - \$1,000,000 Each Accident
 - \$1,000,000 Policy Limit
 - \$1,000,000 Each Employee
- .2 Commercial General Liability (Occurrence Form) - The Contractor shall provide during the life of the Contract such Commercial General Liability (Occurrence Form) Insurance as shall protect him and any Subcontractor performing work under the Contract from claims for damages for Bodily Injury including accidental death, as well as from claims for Property Damage which may arise from operations under the Contract, whether such operations be by himself or by any Subcontractor or by anyone directly or indirectly employed by either of them. This insurance shall be on the Standard Insurance Services Office, Inc. (ISO) Commercial Liability Occurrence Form or other form reasonable acceptable to Owner. The Contractor shall procure insurance coverage for direct operations, sublet work, elevators, contractual liability and completed operations with limits not less than those stated below:
 - .1 A Combined Single Limit for Bodily Injury, Property Damage and Personal Injury of:
 - Limits of Insurance
 - \$2,000,000 General Aggregate (except Products – Completed Operations) Limit
 - \$2,000,000 Products – Completed Operations Aggregate Limit
 - \$1,000,000 Personal and Advertising Injury Limit
 - \$1,000,000 Each Occurrence Limit
 - .3 Property Damages, including Broad Form Property Damage and Explosion, Collapse, Underground property damage coverages, and blasting, where necessary;
 - .4 Completed Operations Liability: Continuous coverage in force for one year after completion of the Work;
 - .5 Commercial Automobile Insurance, including coverage for owned, non-owned and hired vehicles - with limits not less than those stated below:
 - .1 A Combined Single Limit for Bodily Injury and Property Damage of \$1,000,000.
 - .6 Umbrella Liability Insurance: Policy to "pay on behalf of the Insured"
 - Limits of Liability:
 - .1 Contract Amount: \$1,000,000-\$2,000,000:
 - Requires Umbrella Liability Insurance Limit of \$1,000,000.
 - .2 Contract Amount: \$2,000,000 and above:

Requires Umbrella Liability Insurance Limit of \$2,000,000.

- 11.1.5 The insurance required by Section 11.1 shall be written for not less than any limits of liability specified in the Contract Documents, or required by law, whichever is greater.
- 11.1.6 Certificates of Insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. These Certificates shall contain a provision that coverages afforded under the policies will not be canceled until at least thirty (30) days' prior written Notice has been given to the Owner. Failure to provide such Notice shall not limit the liability of the Insurer, its agents or representatives.
- 11.1.7 All insurance policies required in this Article, except Worker's Compensation and Commercial Automobile, shall name the Owner as additional named insured for the insurance.
- 11.1.8 The Contractor shall not commence the Work under the Contract until he has obtained all the insurance required hereunder and such insurance has been approved by the Owner, nor shall the Contractor allow any Subcontractor to commence work on his subcontract until all similar insurance required of the Subcontractor has been so obtained and approved. Approval of the insurance by the Owner shall not relieve or decrease the liability of the Contractor hereunder.
- 11.1.9 The Commercial General Liability and Workers Compensation Policies provided by the Contractor shall have endorsements waiving subrogation against the Owner.

11.2 PROPERTY INSURANCE

- 11.2.1 The Contractor shall purchase and at all times maintain such insurance as will protect the Contractor, the Owner, Subcontractors and Sub-subcontractors from loss or damage to the Work or property in the course of construction, including all machinery, materials and supplies on the premises or in transit thereto and intended to become a part of the finished Work until Final Completion. This insurance shall be in the form of "Builders Risk Covered Cause of Loss Form", or equivalent form, to include but not limited to theft, collapse, earth movement, flood, and portions of the Work stored on site, off site and in transit. Any deductible provision in such insurance shall not exceed ten thousand dollars (\$10,000). Notwithstanding any such deductible provision, the Contractor shall remain solely liable for the full amount of any item covered by such insurance. Such insurance shall be in the initial Contract Sum and shall be increased at Contractor's expense in the amount of all additions to the Contract Sum. Such insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.
- 11.2.2 Any loss insured under Paragraph 11.2.1 is to be adjusted with the Owner and made payable to the Owner as trustee for the insureds, as their interests may appear, subject to the requirements of Paragraph 11.2.4. The Contractor shall pay each Subcontractor a just share of any insurance moneys received by the Contractor, and by appropriate agreement, written where legally required for validity, shall require each Subcontractor to make payments to his Sub-subcontractors in similar manner.
- 11.2.3 The Owner and Contractor waive all rights against each other for damages caused by fire or other perils to the extent their Claims are covered by insurance obtained pursuant to this Section 11.2, or any other property insurance applicable to the Work, except such rights as they may have to the proceeds of such insurance. The Contractor shall require, by appropriate agreement, written where legally required for validity, similar waivers in favor of the Owner and the Contractor by Subcontractors and Sub-subcontractors. With respect to the waiver of rights of

recovery, the term Owner shall be deemed to include, to the extent covered by property insurance applicable thereto, his consultants, employees, and agents and representatives. The Contractor waives as against any Separate Contractor described in Article 6, all rights for damages caused by fire or other perils in the same manner as is provided above as against the Owner. The Owner shall require, by appropriate agreement, written where legally required for validity, similar waivers in favor of the Contractor by any Separate Contractor and his subcontractors and sub-subcontractors.

11.2.4 The Owner as trustee shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within five (5) days after the occurrence of loss to the Owner's exercise of this power, and if such objection is made, the matter shall be decided by a court of competent jurisdiction or as the parties in interest otherwise agree. The Owner as trustee shall, in that case, make settlement with the insurers in accordance with the orders of the court or as otherwise agreed by the parties in interest.

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

11.2.6 The Contractor bears the risk of loss or damage to the Work, the Project, materials stored on site or off site, and Owner's improvements and property under Contractor's control, both during construction and prior to Substantial Completion.

11.3 EFFECT OF SUBMISSION OF CERTIFICATES

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

11.4 FAILURE OF COMPLIANCE

11.4.1 Should the Contractor fail to provide and maintain in force any and all insurance, or insurance coverage required by the Contract Documents or by law, or should a dispute arise between Owner and any insurance company of Contractor over policy coverage or limits of liability as required herein, the Owner shall be entitled to recover from the Contractor all amounts payable, as a matter of law, to Owner or any other parties, had the required insurance or insurance coverage been in force. Said recovery shall include, but is not limited to interest for the loss of use of such amounts of money, plus all attorney's fees, costs and expenses incurred in securing such determination and any other consequential damages arising out of the failure of the Contractor or insurance company to comply with the provisions of the Contract Documents, or any policy required hereby, or any other requirements regarding insurance imposed by law. Nothing herein shall limit any damages for which Contractor is responsible as a matter of law.

11.5 OWNER'S INSURANCE

- 11.5.1 Property Insurance: The Owner, at his option, may purchase and maintain such insurance as will insure him against loss of use of his property due to fire or other hazards, however caused.
- 11.5.2 Commercial Public Liability Insurance: The Owner, at his option, may purchase and maintain insurance which will insure and protect him against claims involving bodily injury and property damage to the public. The Owner does not request his insurer to waive any right of subrogation against the Contractor from claims under this coverage.
- 11.6 LICENSED INSURANCE COMPANIES
- 11.6.1 All insurance companies providing the above insurance shall be licensed by the Insurance Department of the State of North Carolina and have a minimum AM Best "A" rating or similar rating from another rating agency reasonably acceptable to Owner.

ARTICLE 12

CHANGES IN THE WORK

- 12.1 GENERAL PROVISIONS RELATED TO CHANGES
- 12.1.1 A Construction Change Directive is a document issued pursuant to this Paragraph 12.1.1. The Owner may, at any time, without the agreement of the Contractor, by written order signed by the Owner and Design Consultant designated or indicated to be a Construction Change Directive, make any Changes in the Work or add to or subtract from the Work within the general scope of the Contract. A Change in the Work is defined as changes within the general scope of the Contract, including, but not limited to changes:
- .1 In the Specifications or Drawings;
 - .2 In the sequence, method or manner of performance of the Work;
 - .3 In the Owner-furnished facilities, equipment, materials, services or site; or
 - .4 Directing acceleration in the performance of the Work.
- 12.1.2 A Change Order is a document executed pursuant to this Paragraph 12.1.2. The Owner and Contractor may agree to Changes in the Work, the Contract Sum, the Contract Time and any other change in the Contract by written agreement signed by Owner, Contractor and Design Consultant designated or indicated to be a Change Order. If the Contractor, subsequent to the issuance of a Construction Change Directive, agrees to its terms including any applicable adjustment to the Contract Sum and Contract Time, Contractor shall sign it and it shall become a Change Order.
- 12.1.3 The Contractor shall not be entitled to any amount for indirect costs, damages or expenses of any nature, including, but not limited to, so-called "impact" costs, labor inefficiency, wage, material or other escalations beyond the prices upon which the Proposal is based and to which the parties have agreed pursuant to the provisions of Article 12, and which the Contractor, its Subcontractors or Sub-subcontractors or any other person may incur as a result of delays, interferences, suspensions, changes in sequence or the like, for whatever cause, whether reasonable or unreasonable, foreseeable or unforeseeable, or avoidable or unavoidable, arising from the performance of any and all Changes in the Work performed pursuant to this Article 12,

unless the delay is caused solely by the Owner or its agent. It is understood and agreed that the Contractor's sole and exclusive remedy in the event the delay is caused solely by the Owner or its agent shall be recovery of his direct costs as compensable hereunder and an extension of the Contract Time, but only in accordance with the provisions of the Contract Documents. The phrase "Owner or its agent" as used in the Contract, does not include the Prime Contractors or their Subcontractors.

- 12.1.4 No Claim by the Contractor shall be allowed if asserted after final payment under this Contract. No Claim relating to or flowing from a particular change shall be allowed after execution of the Change Order relating to that change or commencement of the change by the Contractor except as specifically provided in Paragraph 12.2.4.
- 12.1.5 If any dispute should arise between the parties with respect to an increase or decrease in the Contract Sum or an expansion or contraction in the Contract Time as a result of a Change in the Work, the Contractor shall not suspend performance of a Change in the Work or the Work itself unless otherwise so ordered by the Owner in writing. The Owner shall, however, pay to the Contractor up to the Owner's reasonable estimated value of the Change in the Work, regardless of the dispute, if said Change in the Work will result in an increase in the Contract Sum; and the Owner shall have the right to withhold payment from the Contractor in an amount up to the Owner's reasonable estimated value of the Change in the Work, regardless of the dispute, if said Change in the Work will result in a decrease in the Contract Sum.
- 12.1.6 No Change in the Work shall be performed without a fully executed Change Order to the Contract a fully executed Construction Change Directive or other Modification to the Contract.
- 12.1.7 If the Contractor intends to assert a Claim under this Article, he must, within ten (10) days after receipt of a Construction Change Directive, Notify the Owner by written statement setting forth the specific nature and cost of such Claim, unless this period is extended by the Owner. The statement of Claim shall include all direct, indirect and impact costs associated with the change, as well as the Contractor's estimate of the schedule impact of the change, if any. The Contractor and its Subcontractors shall not be entitled to reimbursement for any Claims that are not submitted in strict conformance with the Contract. The Contractor shall indemnify and hold the Owner harmless against any Claims by Subcontractors that are waived because they are not submitted in strict conformance with the Contract.
- 12.2 **OWNER DIRECTED CHANGES REQUIRING AN INCREASE IN CONTRACT SUM.**
(For decreases in Contract Sum, refer to Section 12.6)
- 12.2.1 If the Change in the Work will result in an increase in the Contract Sum, the Owner shall have the right to require the performance thereof on a lump sum basis, a unit price basis or a time and material basis, all as hereinafter more particularly described (the right of the Owner as aforesaid shall apply with respect to each such Change in the Work).

If the Owner elects to have the Change in the Work performed on a lump sum basis, its election shall be based on a lump sum Proposal which shall be submitted by the Contractor to the Owner within ten (10) days of the Contractor's receipt of a request therefore (but the Owner's request for a lump sum Proposal shall not be deemed an election by the Owner to have the Change in the Work performed on a lump sum basis). The Contractor's Proposal shall be itemized and segregated by labor and materials for the various components of the Change in the Work (no aggregate labor total will be acceptable) and shall be accompanied by signed Proposals of any Subcontractors who will perform any portion of the Change in the Work and of any persons who will furnish materials or equipment for incorporation therein. The Proposal shall also include

the Contractor's estimate of the time required to perform said changes. The Contractor shall provide any documentation that may be requested by the Owner or Architect to support the change proposal, including but not limited to payroll records, insurance rates, material quotes, and rental quotes.

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

The portion of the Proposal relating to materials may include the reasonably anticipated direct costs to the Contractor or to any of its Subcontractors of materials to be purchased for incorporation in the Change in the Work, plus transportation and applicable sales and use taxes and up to fifteen percent (15%) of said direct material costs as overhead and profit for the Contractor or any such Subcontractor (said overhead and profit to include all small tools), and may further include the Contractor's and any of its Subcontractor's reasonably anticipated rental costs in connection with the Change in the Work (either actual or discounted local published rates), plus up to eight percent (8%) thereof as overhead and profit for the Contractor or any such Subcontractors, as applicable. The Contractor shall provide an itemized breakdown of all transportation and shipping costs, including receipts documenting the expenses. Notwithstanding the above, overhead and profit shall not be applied to any sales tax paid for any purpose or to any transportation or shipping costs incurred by the Contractor or any subcontractor. If any of the items included in the lump sum Proposal are covered by unit prices contained in the Contract Documents, the Owner may, if it requires the Change in the Work to be performed on a lump sum basis, elect to use these unit prices in lieu of the similar items included in the lump sum Proposal, in which event an appropriate deduction will be made in the lump sum amount prior to the application of any allowed overhead and profit percentages. No overhead and profit shall be applied to any unit prices.

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

12.2.2 In the event that the Contractor fails to submit his Proposal within the designated period, the Owner may order the Contractor to proceed with the Change to the Work and the Contractor shall so proceed. The Owner shall unilaterally determine the reasonable cost and time to perform the Work in question, which determination shall be final and binding upon the Contractor. The Contractor may dispute such action in accordance with the Article 15.

12.2.3 In the event that the parties are unable to agree as to the reasonable cost and time to perform the Change in the Work based upon the Contractor's Proposal and the Owner does not elect to have the Change in the Work performed on a time and material basis, the Owner may choose to make a determination of the reasonable cost and time to perform the Change in the Work, based upon its own estimates, the Contractor's submission or a combination thereof. A Construction Change Directive shall be issued in this case for the amounts of cost and time determined by the Owner

and shall become final and binding upon the Contractor, subject to Contractor's right to dispute such action in accordance with Article 15. Owner has the right to direct by Construction Change Directive a Change in the Work, which is the subject of such Change Order. Failure of the parties to reach agreement regarding the cost and time of the performing the Construction Change Directive, shall not relieve the Contractor from performing the Change in the Work promptly and expeditiously.

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

12.2.4 If the Owner elects to have the Change in the Work performed on a time and material basis, the same shall be performed, whether by the Contractor's forces or the forces of any of its Subcontractors or Sub-subcontractors, at actual cost to the entity performing the Change in the Work (without any charge for administration, clerical expense, supervision or superintendence of any nature whatsoever, including foremen, or the cost, use or rental of tools or plant), plus fifteen percent (15%) thereof as the total overhead and profit (except that said fifteen percent (15%) shall not be applied against any payroll costs, as set forth in Paragraph 12.2.1.) The Contractor shall submit to the Owner daily time and material tickets, on a daily basis to include the identification number assigned to the Change in the Work, the location and description of the Change in the Work, the classification of labor employed (and names and social security numbers), the materials used, the equipment rented (not tools) and such other evidence of cost as the Owner may require. The Owner may require authentication of all time and material tickets and invoices by persons designated by the Owner for such purpose. The failure of the Contractor to secure any required authentication shall, if the Owner elects to treat it as such, constitute a waiver by the Contractor of any Claim for the cost of that portion of the Change in the Work covered by a non-authenticated ticket or invoice; provided, however, that the authentication of any such ticket or invoice by the Owner shall not constitute an acknowledgment by the Owner that the items thereon were reasonably required for the Change in the Work.

12.2.5 No overhead and profit will be paid by the Owner on account of a Change in the Work except as specifically provided in Section 12.2. Overhead and profit, as allowed under Section 12.2, shall be deemed to include all costs and expenses which the Contractor or any of its Subcontractors may incur in the performance of a Change in the Work and which are not otherwise specifically recoverable by them pursuant to Section 12.2.

12.3 CONTRACTOR NOTICE OF CHANGE

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

12.4 MINOR CHANGES IN THE WORK

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

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

12.5 DIFFERING SITE CONDITIONS

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

12.6 OWNER DIRECTED CHANGES REQUIRING A DECREASE IN CONTRACT SUM.

12.6.1 If the Change in the Work will result in a decrease in the Contract Sum, the Owner may request a quotation by the Contractor of the amount of such decrease. The following provisions shall apply:

The portion of the Proposal relating to labor, whether by the Contractor's forces or the forces of any of its Subcontractors, shall include reasonably anticipated gross wages of job site labor, including foremen, who would have been directly involved in the Work that has been deleted from the Contract, (for such time as they would have been so involved), plus payroll costs (including premium costs of overtime time, if overtime was anticipated, Social Security, Federal or State unemployment insurance taxes and fringe benefits required by collective bargaining agreements entered into by the Contractor or any such Subcontractor in connection with such labor) and seven percent (7%) of such anticipated gross wages, but not payroll costs, as overhead and profit not incurred or earned by the Contractor or any such Subcontractor, as applicable (said overhead and profit to include all supervision except foremen).

The portion of the Proposal relating to materials shall include the reasonably anticipated direct costs which would have been incurred by the Contractor or to any of its Subcontractors of materials which would have been purchased for incorporation in the Work but which has been deleted from the Contract, plus transportation and applicable sales and use taxes which will be avoided and seven percent (7%) of said direct material costs as overhead and profit not incurred or earned by the Contractor or any such Subcontractor (said overhead and profit to include all small tools), and shall further include the Contractor's and any of its Subcontractor's reasonably anticipated rental costs which will be avoided (either actual or discounted local published rates), plus five percent (5%) thereof as overhead and profit not incurred or earned by the Contractor or any such Subcontractors, as applicable. If any of the items included in the lump sum Proposal are covered by unit prices contained in the Contract Documents, the Owner may elect to use these unit prices in determining the amount of reduction to the Contract Sum as a result of a

deletion of Work from the Contract. No overhead and profit shall be applied to any unit prices for purposes of calculation such reduction in the Contract Sum.

The lump sum Proposal for Work which would have been performed by any Subcontractors shall include four percent (4%) of that amount as an estimate of the Contractor's overhead and profit that will not be earned by Contractor due to the decrease in the Contract Sum.

The Contractor's quotation shall be forwarded to the Owner within ten (10) days of the Owner's request and, if acceptable to the Owner, shall be incorporated in the Change Order. If not acceptable, the parties shall make every reasonable effort to agree as to the amount of such decrease, which may be based on a lump sum properly itemized, on unit prices stated in the Contract Documents and/or on such other basis as the parties may mutually determine. If the parties are unable to so agree, the amount of such decrease shall be the total of the estimated reduction in actual cost of the Work, as determined by the Owner in its reasonable judgment, plus overhead and profits stated above. This shall become final and binding upon the Contractor, subject to Contractor's right to dispute such action in accordance with the Article 15.

ARTICLE 13

UNCOVERING AND CORRECTION OF WORK

13.1 UNCOVERING OF WORK

13.1.1 If any portion of the Work is covered contrary to the request of the Owner or the Design Consultant or to requirements specifically expressed in the Contract Documents or to requirements of applicable construction permits, it must, if required in writing by the Owner, be uncovered for his observation and shall be replaced at the Contractor's expense.

13.1.2 If any other portion of the Work has been covered which the Design Consultant or the Owner has not specifically requested to observe prior to being covered, either may request to see such portion of the Work and it shall be uncovered by the Contractor. If such Work be found in accordance with the Contract Documents, the cost of uncovering and replacement shall, by appropriate Change Order, be charged to the Owner. If such Work be found not in accordance with the Contract Documents, the Contractor shall pay such costs unless it is found that this condition was caused by the Owner, in which event the Owner shall be responsible for the payment of such costs. If such condition was caused by a Separate Contractor, Contractor may proceed against and only against, said Separate Contractor as provided in Article 6. Any costs to the Owner pursuant to this Paragraph shall be determined in accordance with the provisions of Article 12.

13.2 CORRECTION OF WORK

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

13.2.2 The Contractor, unless removal is waived by the Owner, shall remove from the site all portions

of the Work which are defective or non-conforming, or if permitted or required, he shall correct such portions of the Work in place at his own expense promptly after receipt of Notice, and such rejected Work shall not thereafter be tendered for acceptance unless the former rejection or requirement for correction is disclosed.

- 13.2.3 If the Contractor does not proceed with the correction of such defective or non-conforming portions of the Work within a reasonable time fixed by written Notice from the Owner or Design Consultant, the Owner may either (1) by separate contract or otherwise replace or correct such portions of the Work and charge the Contractor the cost incurred by the Owner thereby and remove and store the materials or equipment at the expense of the Contractor, or (2) terminate this Contract for default as provided in Section 14.3, or both, or take any other measure allowed by law.
- 13.2.4 The Contractor shall bear the cost of making good all work of the Owner or Separate Contractors destroyed or damaged by such correction or removal.
- 13.2.5 Nothing contained in this Section 13.2 shall be construed to establish a period of limitation with respect to any other obligation which the Contractor might have under the Contract Documents, including Section 4.6 hereof. The establishment of the time period of one year after the date of Substantial Completion or such longer period of time as may be prescribed by law or by the terms of any warranty required by the Contract Documents relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which his obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to his obligations.

13.3 ACCEPTANCE OF DEFECTIVE OR NON-CONFORMING WORK

- 13.3.1 If the Owner prefers to accept defective or non-conforming Work, he may do so instead of requiring its removal and correction, in which case a Change Order will be issued to reflect a reduction in the Contract Sum where appropriate and equitable, or the Owner may elect to accept payment in materials or services, in lieu of a reduction in the Contract Sum. If the amount of a reduction is determined after final payment, it shall be paid to the Owner by the Contractor.

ARTICLE 14

TERMINATION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR

- 14.1.1 If the Work is stopped for a period of one hundred twenty (120) days by the Owner or under an order of any court or other public authority having jurisdiction, or as a result of an act of government, such as a declaration of a national emergency making materials unavailable, and through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing any of the Work under a contract with the Contractor, then the Contractor may, upon seven (7) additional days' written Notice to the Owner and the Design Consultant, terminate the Contract and recover from the Owner payment on a quantum merit basis, for all Work executed for which Contractor has not previously been paid, less any amounts Contractor may owe Owner under the Contract Documents and less any amounts Owner is entitled to withhold from Contractor or backcharge to the Contractor under the Contract Documents or pursuant to law. The Contractor shall not be entitled to collect and hereby

expressly waives any overhead or profit on Work not performed and any damages related to that portion of the Contract which has been terminated.

14.2 TERMINATION FOR CONVENIENCE OF THE OWNER

14.2.1 The Owner may, at any time upon ten (10) days written Notice to the Contractor and to the Contractor's Surety, which Notice shall specify that portion of the Work to be terminated and the date said termination is to take effect, terminate (without prejudice to any right or remedy of the Owner) the whole or any portion of the Work for the convenience of the Owner. The Contractor's sole remedy, in the event of such termination, will be the allowable termination costs permitted by Section 14.4. Contractor shall include termination clauses identical to Article 14 in each of his subcontracts.

14.3 DEFAULT TERMINATION

14.3.1 Ten (10) days after written Notice is mailed to the Contractor and to the Contractor's Surety, the Owner may terminate (without prejudice to any right or remedy of the Owner or any subsequent buyer of any portion of the Work) the employment of the Contractor and his right to proceed either as to the whole or any portion of the Work required by the Contract Documents and may take possession of the Work and complete the Work by contract or otherwise in any one of the following circumstances:

- .1 If the Contractor or its Surety refuses or fails to prosecute the Work or any separable part thereof with such diligence as will ensure the Substantial and Final Completion of the Work by the dates specified in the Supplemental Conditions for Substantial and Final Completion or fails to complete the Work or remedy a default within said period;
- .2 If the Contractor is in material default in carrying out any provisions of the Contract;
- .3 If the Contractor fails to supply a sufficient number of properly skilled workers or proper equipment or materials;
- .4 If the Contractor fails to make prompt payment to Subcontractors or for materials or labor, unless he otherwise provides the Owner satisfactory evidence that payment is not legally due;
- .5 If the Contractor disregards laws, permits, ordinances, rules, regulations or orders of any public authority having jurisdiction, or fails to follow the instructions of the Owner;
- .6 If the Contractor substantially violates any provisions of the Contract Documents; or
- .7 If the Contractor refuses or fails to properly schedule, plan, coordinate and execute the Work, as specified herein, so as to perform the Work within the specified Completion Dates, or to provide scheduling or related information, revisions and updates as required by the Contract Documents.

14.3.2 The right of the Contractor to proceed shall not be so terminated under this Section 14.3 if the delays in the completion of the Work are due to unforeseeable causes beyond the control and without the fault or negligence of the Contractor or his Subcontractors as specifically set forth in Section 8.3 hereof.

14.3.3 If, after the Contractor has been terminated for default pursuant to Section 14.3, it is determined

that none of the circumstances set forth in Paragraph 14.3.1 exist, then such termination shall be considered a termination for convenience pursuant to Section 14.2. In such case, the Contractor's sole remedy will be the costs permitted by Section 14.4.

- 14.3.4 If the Owner so terminates the employment of the Contractor due to the Contractor's default, the Contractor shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the compensation to be paid to the Contractor hereunder shall exceed the expense of so completing the Work (including compensation for additional managerial, administrative, consultant and inspection services, attorney's fees and any damages for delay) such excess shall be paid to the Contractor.
- 14.3.5 If such expenses referenced in Paragraph 14.3.1, shall exceed the unpaid balance, the Contractor and his sureties shall be liable to the Owner for such excess. If the right of the Contractor to proceed with the Work is partially or fully terminated, the Owner may take possession of and utilize in completing the Work such materials, appliances, supplies, plant and equipment as may be on the site of the terminated portion of the Work and necessary for the completion of the Work. If the Owner does not fully terminate the right of the Contractor to proceed, the Contractor shall continue to perform the part of the Work that is not terminated.
- 14.3.6 If the Owner terminates the whole or any part of the Work pursuant to Section 14.3, the Owner may procure, upon such terms and in such manner as the Owner may deem appropriate, supplies or services similar to those so terminated, and the Contractor shall be liable to the Owner for any excess costs for such similar supplies or services. The Contractor shall continue the performance of the Contract to the extent not terminated hereunder.

14.4 ALLOWABLE TERMINATION COSTS

- 14.4.1 If the Owner terminates the whole or any portion of the Work pursuant to Section 14.2, then the Owner shall only be liable to the Contractor for those costs reimbursable to the Contractor in accordance with Paragraph 14.4.2, plus a markup of ten percent (10%) for profit and overhead on the actual fully accounted costs specified under Paragraph 14.4.2; provided however, that if there is evidence that the Contractor would have sustained a loss on the entire Contract had it been completed, no profit or overhead shall be included or allowed hereunder for the Work performed and an appropriate adjustment shall be made reducing the amount of the settlement to reflect the indicated rate of loss. Under no circumstances shall the Contractor be entitled to any loss profit on the Work terminated pursuant to Section 14.2.
- 14.4.1.1 After receipt of a Notice of Termination, the Contractor shall submit to the Owner his termination Claim, in the form and with certification prescribed by the Owner. Such Claim shall be submitted promptly but in no event later than three (3) months from the effective date of termination, unless one or more extensions in writing are granted by the Owner upon request of the Contractor made in writing within such three (3) month period or authorized extension thereof. However, if the Owner determines that the facts justify such action, he may receive and evaluate any such termination Claim at any time after such three (3) month period or any extension thereof. Upon failure of the Contractor to submit his termination Claim within the time allowed, the Owner may determine, on the basis of information available to him, the amount, if any, due to the Contractor by reason of the termination and such termination shall be final and binding on the Contractor.
- 14.4.2 If the Owner terminates the whole or any portion of the Work pursuant to Section 14.2, the Owner shall pay the Contractor an amount for supplies, services, or property accepted by the Owner, and which is in accordance with the Contract Documents, in an amount as if the Contract

had not been terminated. In addition, in such event, the Owner shall pay to Contractor an amount representing Contractor's actual cost, excluding any overhead and profit for the items and things specified in Subparagraph 14.5.1.6 and not heretofore paid for, appropriately adjusted for any saving of freight or other charges. Under no circumstances shall the Contractor be entitled to any loss profit on the Work terminated pursuant to Section 14.2.

14.4.2.1 The Contractor agrees that neither the Owner nor the Design Consultant will be liable for payments to Contractors or Subcontractors pursuant to Section 14.4.2 unless each contract and subcontract contains termination provisions identical to those set forth in this Article 14. The Owner and the Design Consultant will not be liable to the Contractor or any of the Subcontractors for any costs associated with termination if the contract or subcontract of the party involved does not include the required termination language.

14.4.3 In arriving at any amount due the Contractor pursuant to Section 14.4, there shall be deducted the following:

- .1 All unliquidated advance or other payments on account theretofore made to the Contractor applicable to the terminated portion of the Contract;
- .2 Any Claim which the Owner may have against the Contractor;
- .3 Such amount as the Owner determines to be necessary to protect the Owner against loss because of outstanding or potential liens or claims; and
- .4 The agreed price for, or the proceeds of sale of, any materials, supplies or other things acquired by the Contractor sold, pursuant to the provisions of Subparagraph 14.5.1.7, and not otherwise recovered by or credited to the Owner, or returned for a refund by the Contractor.
- .5 All other amounts the Owner is entitled to withhold from the Contractor or charge to the Contractor pursuant to the Contract or as allowed by applicable law.

14.4.4 The total sum to be paid to the Contractor under Section 14.4 shall not exceed the Contract Sum as reduced by the amount of payments otherwise made or to be made for Work not terminated and as otherwise permitted by the Contract. Except for normal spoilage, and except to the extent that the Owner shall have otherwise expressly assumed the risk of loss, there shall be excluded from the amounts payable to the Contractor, as provided in Paragraph 14.4.2, the fair value, as determined by the Owner, of property which is destroyed, lost, stolen or damaged so as to become undeliverable to the Owner, or to a buyer pursuant to Subparagraph 14.5.1.7.

14.5 GENERAL TERMINATION PROVISIONS

14.5.1 After receipt of a Notice of termination from the Owner, pursuant to Section 14.2 or 14.3, and except as otherwise directed by the Owner, the Contractor shall:

- .1 Stop work under the Contract on the date and to the extent specified in the Notice of termination;
- .2 Place no further orders or subcontracts for materials, services or facilities, except as may be necessary for completion of such portion of the Work under the Contract as is not terminated;

- .3 Terminate all orders and subcontracts to the extent that they relate to the performance of the Work terminated by the Notice of termination;
- .4 At the option of the Owner, and in lieu of terminating such orders and subcontracts, assign to the Owner in the manner, at the times and to the extent directed by the Owner in writing, all of the rights in the such orders and subcontracts,
- .5 Settle all outstanding liabilities and all Claims arising out of such termination or orders and subcontracts, with the approval or ratification of the Owner in writing, to the extent he may require, which approval or ratification shall be final for all the purposes of this Article;
- .6 Transfer title and deliver to the entity or entities designated by the Owner, in the manner, at the times and to the extent directed by the Owner to the extent specifically produced or specifically acquired by the Contractor for the performance of such portion of the Work as had been terminated, the following:
 - (1) The fabricated or unfabricated parts, Work in process, partially completed supplies and equipment, materials, parts, tools, dies, jigs and other fixtures, completed Work, supplies and other material produced as part of, or acquired in connection with the performance of, the Work terminated by the Notice of termination; and
 - (2) The completed or partially completed plans, drawings, information, releases, manuals and other property related to the Work and which, if the Contract had been completed, would have been required to be furnished to the Owner;
- .7 Use his best efforts to return for a refund or sell, in the manner, at the times, to the extent and at the price or prices directed or authorized by the Owner, any property of the types referred to in Subparagraph 14.5.1.6; provided, however, that the Contractor:
 - (1) Shall not be required to extend credit to any buyer, and
 - (2) May acquire any such property under the conditions prescribed by and at a price or prices approved by the Owner in writing; and provided further that the proceeds of any such transfer or disposition shall be applied in reduction of any payments to be made by the Owner to the Contractor under the Contract or shall otherwise be credited to the Contract Sum covered by the Contract or paid in such other manner as the Owner may direct;
- .8 Complete performance of such part of the Work as shall not have been terminated by the Notice of termination;
- .9 Take such action as may be necessary, or as the Owner may direct, for the protection and preservation of the property related to the Contract which is in the possession of the Contractor and in which the Owner has or may acquire an interest; and
- .10 Otherwise mitigate any damages Contractor claims to suffer as a result of a termination.

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

approved by the Owner, photographs, micro-photographs or other authentic reproductions thereof.

- 14.5.3 If the termination, pursuant to Section 14.2, be partial, the Contractor may file with the Owner a Claim for an equitable adjustment of the price or prices specified in the Contract relating to the continued portion of the Contract (the portion not terminated by the Notice of termination), and such equitable adjustment as may be agreed upon shall be made in such price or prices. Any Claim by the Contractor for an equitable adjustment under this Paragraph must be asserted within thirty (30) days from the effective date of the Notice of termination.
- 14.5.4 The Contractor shall refund to the Owner any amounts paid by the Owner to the Contractor in excess of costs reimbursable under Section 14.4.
- 14.5.5 The Contractor shall be entitled to only those damages and that relief from termination by the Owner as specifically provided in Article 14.

ARTICLE 15

DISPUTE RESOLUTION

15.1 INITIATING CLAIMS

- 15.1.1 Claims must be initiated by written Notice to the Owner and to the party against whom the Claim is made with a copy to the Design Consultant. The responsibility to substantiate Claims shall rest with the party making the Claim.
- 15.1.2 Nothing in the Contract shall be construed as meaning that the Owner's assessment of Liquidated Damages is a Claim as defined herein, or that the Owner has the burden of proof to assess Liquidated Damages. Should the Owner assess Liquidated Damages, the burden of proving that such damages should not have been assessed shall rest upon the Contractor.

15.2 RESOLUTION OF CLAIMS AND DISPUTES BETWEEN CONTRACTOR AND OWNER

- 15.2.1 Claims by Contractor against Owner and by Owner against Contractor, including those alleging an error or omission by the Design Consultant shall be subject to the process set forth in this Section 15.2. Such Claims shall be referred initially to the Design Consultant for a decision. A final decision by the Design Consultant, or the failure of the Design Consultant to issue a final decision shall be required as a condition precedent to mediation or litigation of all such Claims arising prior to the date final payment is due. The Design Consultant will initially decide disputes between Owner and Contractor.
- 15.2.2 The Design Consultant will review Claims by Contractor and Owner against each other and within twenty (20) days of the receipt of the written Claim and take one or more of the following actions:
- .1 Request additional supporting data from the claimant or a response with supporting data from the other party;
 - .2 Reject the Claim in whole or in part;
 - .3 Approve the Claim;

- .4 Suggest a compromise; or
 - .5 Advise the parties that the Design Consultant is unable to resolve the Claim if the Design Consultant lacks sufficient information to evaluate the merits of the Claim or if the Design Consultant concludes that it would be inappropriate for the Design Consultant to resolve the Claim.
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- 15.2.3 In evaluating Claims made under this Section 15.2, the Design Consultant may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who assist the Design Consultant in rendering a decision.
 - 15.2.4 If the Design Consultant requests a party to provide a response to a Claim under this Section 15.2, or to furnish additional supporting data, such party shall respond, within ten (10) days after receipt of such request, and shall within such time period, either provide a response to the requested supporting data, advise the Design Consultant when the response or supporting data will be furnished, or advise the Design Consultant that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Design Consultant will either reject or approve the Claim in whole or in part.
 - 15.2.5 The Design Consultant will approve or reject Claims under this Section 15.2 by written decision, which shall state the reason thereof and which shall notify the parties of any change in the Contract Sum or Contract Time or both. The approval or rejection of a Claim by the Design Consultant under this Section 15.2 shall be final and binding on the parties but subject to mediation and litigation.
 - 15.2.6 When a written decision of the Design Consultant under this Section 15.2 states that the decision is final but subject to mediation, then a demand for mediation of a Claim covered by such decision must be made within thirty (30) days after the date on which the party making the demand receives the final written decision. Any failure to demand mediation within said thirty (30) days' period shall result in the Design Consultant's decision becoming final and binding to all parties. Claims not resolved in mediation shall be subject to litigation if in accordance with the applicable statutes of limitation and repose.
 - 15.2.7 Upon receipt of a Claim under Section 15.2 against the Contractor or at any time thereafter, the Design Consultant or the Owner may, but is not obligated to, notify the Surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Design Consultant or the Owner may, but are not obligated to, notify the Surety and request the Surety's assistance in resolving the controversy.
 - 15.2.8 If the Design Consultant deems that a Claim under this Section 15.2 is valid, the Design Consultant shall require all parties to the dispute to share the cost of the Design Consultant's review equitably. If the Design Consultant deems that a Claim under this Section 15.2 is invalid, the Design Consultant shall require the complaining party to bear the cost of the Design Consultant's review. In any event, the Design Consultant may require the complaining party to submit a deposit equivalent to the Design Consultant's hourly rate multiplied by the amount of time the Design Consultant estimates, in the Design Consultant sole discretion, that will be necessary to review the Claim. The Design Consultant shall return any unused portion of this initial deposit to the complaining party following the Design Consultant's completion of the Design Consultant's review of the Claim. Nothing in these procedures shall entitle the Design Consultant to compensation for additional services from the Owner that is not authorized pursuant to the terms and conditions of the Agreement for Design Consultant Services.

15.3 TIME LIMITS ON CLAIMS

15.3.1 Unless a shorter time is provided in the Contract Documents, Claims by Contractor or any party except Owner must be initiated within twenty (20) days after occurrence of the event giving rise to such Claim or within twenty (20) days after the claimant first recognizes the condition giving rise to the Claim, whichever is later. Claims against the Owner shall be initiated in strict conformance with the Contract Documents. Nothing in these procedures shall extend the period within or the manner in which Claims against the Owner must be submitted. Claims must be initiated by written Notice to the Owner and written notice to the other party and to the Design Consultant. Any Claim against the Owner that is not initiated within the applicable time period is waived. Claims by Owner may be made at any time within the applicable statute of limitations and repose.

15.4 CONTINUING CONTRACT PERFORMANCE

15.4.1 Pending final resolution of a Claim, the Contractor shall proceed diligently with the performance of the Contract, unless instructed otherwise in writing by the Owner.

15.5 MEDIATION

15.5.1 As required by N.C.G.S 143-128 (f1), any Claim as defined herein, which exceeds fifteen thousand dollars(\$15,000.00), and which concerns a party involved in the Project, including the Owner, Contractor, Design Consultant, any construction manager, Separate Contractors, or first and lower tier Subcontractors and which arise out of the Contract or the construction process, except those waived Claims shall, be subject to mediation as a condition precedent to the institution of legal proceedings by any party, except that any party may institute legal proceedings or perfect any mechanic's or materialmen's lien in order to meet any applicable statute of limitations or similar deadline prior to engaging in mediation.

15.5.2 The parties shall endeavor to resolve their Claims under this Section 15.5 by mediation which, unless the parties mutually agree otherwise, shall be in accordance with the rules established by the Owner.

15.5.3 The parties shall share cost of the mediation equally except that if the Owner is a party to the dispute, the Owner shall pay at least one third of the cost of the mediation.

15.5.4 The mediation shall be held in a place where the Project is located, unless another location is mutually agreed upon.

15.5.5 Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

END OF GENERAL CONDITIONS

SECTION SC

SUPPLEMENTARY CONDITIONS

GENERAL CONDITIONS

Document GC, GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, constitutes the General Conditions of this Contract, and is hereinafter called "General Conditions." The General Conditions are further revised and supplemented by the provisions of these Supplementary Conditions. The General Conditions and the Supplementary Conditions are applicable to all of the Work under this contract and shall apply to the Contractor and all Subcontractors and Sub-subcontractors.

SUPPLEMENTS:

The following supplements modify, change, delete, or add to the General Conditions. Where any article of the General Conditions is modified or any paragraph deleted, subparagraph or clause thereof is modified, or deleted by these supplements, the unaltered provisions of such article, paragraph, subparagraph or clause shall remain in effect. If there is a discrepancy between the General Conditions and these Supplementary Conditions, the Supplementary Conditions shall control.

ARTICLE 1 - CONTRACT DOCUMENTS

ADD THE FOLLOWING TO SUBPARAGRAPH 1.1.1:

- 1.1.1.1 The Drawings and Specifications referred to in the Contract Documents have been prepared by Hite Associates, PC and are identified by the title:

Cafeteria Addition to Overhills High School

REVISE SUBPARAGRAPH 1.3.1.1 TO READ:

- 1.3.1.1 The Contractor will be furnished with the following quantities of drawings and specifications free. Additional copies will be provided at cost.

General Contractor 10 sets

ARTICLE 2 - ARCHITECT

ADD THE FOLLOWING TO PARAGRAPH 2.1:

Design Consultant:

[Hite Associates, PC
2600 Meridian Drive
Greenville, NC 27834]

ARTICLE 8 - TIME

ADD THE FOLLOWING TO PARAGRAPH 8.2:

8.2.5 The schedule below contains certain specific dates in addition to date of Notice to Proceed and Time for Completion. These dates shall be adhered to and are the last acceptable dates unless modified by mutual agreement between the Contractor and the Owner. All dates indicate midnight unless otherwise stipulated. The only exceptions to this schedule are defined in the General Conditions and Supplementary Conditions under Paragraph 8.3 DELAYS AND EXTENSIONS OF TIME.

Notice of Intent to Award – [TO BE DETERMINED]

Return of Owner Contractor Agreement by Contractor – [SEVEN CALENDAR DAYS FOLLOWING DATE OF NOTICE OF INTENT TO AWARD]

Notice to Proceed – [SEVEN DAYS FOLLOWING RECEIPT OF CONTRACT FROM CONTRACTOR.]

Substantial Completion – [240 CALENDAR DAYS FROM DATE OF NOTICE TO PROCEED]

Completion of all Commissioning – [NOT APPLICABLE]

Final Completion – [30 CALENDAR DAY FROM DATE OF SUBSTANTIAL COMPLETEION]

8.2.5.1 The Owner reserves the right to withhold the issuance of Notice to Proceed by up to thirty (30) days. For each day that Notice to Proceed is withheld pursuant to this Subparagraph, the dates established for Substantial Completion and Final Completion shall be adjusted. The contractor shall not be entitled to additional compensation if the owner withholds the issuance of Notice to Proceed pursuant to this Subparagraph.

ARTICLE 9 - PAYMENTS AND COMPLETION

ADD THE FOLLOWING TO Paragraph 9.8:

9.8.6.1 Additional services and dispute resolution services by the Design Consultant shall be paid by the Contractor at the rate of One Hundred and Seventy-Five dollars (\$ 175.00) per hour.

ADD THE FOLLOWING TO Paragraph 9.10:

9.10.1.1 Substantial Completion Liquidated Damages shall be the sum of Five Hundred dollars (\$ 500.00) per calendar day, and this amount shall be assessed in accordance with Subparagraph 9.10.1 of the General Conditions.

9.10.2.1 Final Completion Liquidated Damages shall be the sum of Five Hundred dollars (\$ 500.00) per calendar day, and this amount shall be assessed in accordance with Subparagraph 9.10.2 of the General Conditions.

END OF SUPPLEMENTARY CONDITIONS

GO TO NEXT PAGE

SUMMARY OF WORK

This project involves the furnishing of all labor, materials, and services necessary to complete the construction of the CAFETERIA ADDITION TO OVERHILLS HIGH SCHOOL, Harnett County Schools, North Carolina as shown by the drawings and as specified herein.

CONSTRUCTION SCHEDULE

Each Prime Contractor shall coordinate his work with the others to complete his work, on schedule, within the specified time allowed. Within thirty days of award of Contracts to the successful Bidders, the General Contractor will prepare, with the assistance of each Prime Contractor, a Master Construction Schedule, in both bar chart and critical path method form, which shall be signed by each Contractor and become a requirement and part of the Contract Documents.

The Schedule shall include work by Architect and Owner, as may be required by the contractor (i.e. Critical shop drawing review, color selection, inspections, etc.).

The Master Schedule shall be created in electronic computer form using an industry-recognized "Critical Path Method" software program, and continuously maintained for the benefit and use of all Contractors and the Owner/Architect. The General Contractor shall submit to all parties, at each monthly meeting, printed reports, generated from the computer program file, indicating the current status of all project activities, including those of the other Contractors.

CONTRACTS

Contracts will be executed for each Prime Contractor on AIA Document A101, Standard Form of Agreement Between Owner and Contractor, as amended herein.

PAYMENTS

Payments to the Contractor will be made on the basis of ninety percent (95%) of monthly estimates approved by the Architect.

Bids shall include North Carolina sales and Use Tax or local sales and use tax. The Owner shall be entitled to reimbursement of taxes paid by Contractor on basis shown separately on monthly request for payment. At the time of delivery of the periodic monthly estimate and request for progress payments, the Contractor shall attach to such requests a statement which shall show the amount of sales tax paid by the Contractor upon purchases of building materials during the period covered by the progress payment request. A sworn statement by the Contractor shall be attached stating that the property upon which such sales taxes were paid was or will be used in the performance of the contract. Sales tax on purchases or rental of tools and equipment is taxable to the Contractor and shall not be included in the sworn statement. Refer to Section 01011, Supplementary Conditions, subparagraph 9.3.4 for additional requirements.

CONSTRUCTION PROCEDURES

The following Construction Procedures are to be implemented for this project:

1. The General Contractor shall be the Project Coordinator, and as such shall schedule and manage the entire work. Notify the Architect immediately upon any conflict with separate Prime Contractors.
2. The General Contractor shall coordinate with all Prime Contractors to prepare and submit to the Architect within two weeks following the date of the Notice to Proceed his proposed Progress Schedule for completing the Project in the specified time. Include critical shop drawing reviews, inspections, or other work to be scheduled with Architect or Engineer.

3. Approved Schedule shall be distributed to all other Prime Contractors by the General Contractor. Also, post copy in Contractor's field office. General Contractor shall keep other contractors, including his subcontractors, informed of his planned and actual progress, so that the Project Schedule can be maintained.
4. All other prime and sub-contractors shall organize their work to conform to this Schedule and see that all phases of the work progress as smoothly and efficiently as possible.
5. The General Contractor will coordinate the location of tool sheds and storage areas for all contractors within the limits of the site area designated or approved by the Owner.
6. All Contractors shall submit within twenty (20) days from the date of the Notice to Proceed a complete list of all subcontractors and material suppliers (including addresses), that they propose to use on this Project for Architect's and Engineer's approval.
7. All Contractors are requested to furnish the Architect with the name of their project manager, safety manager, and job foreman or superintendent who will be in charge of the work. These men will not be changed during the course of construction without prior notice to the Architect. Furnish Architect and Owner with name and home telephone number of job superintendent and project manager for emergency contact.
8. Architect will hold monthly meetings at the project site on a day and time to be determined. Each Contractor shall have his job superintendent and project manager present. The purpose of these meetings is to evaluate progress, resolve problems, and in general to help expedite construction. Meeting representatives must have authority to act on behalf of the Contractor.
9. See Specifications, Division 1, General Requirements, for information relative to the following:
 - a. Schedules and Reports
 - b. Samples and Shop Drawings
 - c. LEED Requirements (THIS IS NOT A LEED PROJECT)
 - d. Temporary Facilities and Controls
 - e. Cleaning Up
 - f. Project Close Out
10. To expedite handling paperwork, the following procedures shall be used:
 - a. Electronic (encrypted PDF's) shop drawings and submittals are required. Provide physical material samples, color charts and samples coordinated with general submittal requirements.
 - b. Each Contractor shall submit to the Architect a cost breakdown of his contract on standard AIA form. Breakdown shall show labor and material. Upon approval by Architect and Engineer, this breakdown shall be used for progress payments.
 - c. Contractor's payment period shall be from the twenty-fifth day of the month to the twenty-fifth day of the following month. Contractor shall forward to the Architect by the first of the following month his Application for Payment in five (5) copies. Owner will make payments by the fifteenth of the month.
 - d. Sales tax expenditures for each pay period shall be substantiated with an attached certified statement by the Contractor and each of his Subcontractors individually

- showing total purchases of material from each separate vendor and total sales taxes paid each vendor for the applicable period.
- e. Payment for material stored on site will be approved upon verification of material and quantity. Payment will also be approved if material is stored in a bonded warehouse approved by the Architect and Owner and insured for its full value. Include insurance certificates and certificates verifying storage in bonded warehouse with Application for Payment of such materials.
 - f. Submit copy of Building Permit prior to or with submission of first Pay Application. Payments will be withheld until permit copy is submitted.
11. All materials and submittal data must be approved before Contractor proceeds with installing such items in the Project. All materials requiring color selection shall be submitted together. An incomplete color schedule will not be issued. All material samples must be submitted in order to make a complete, coordinated schedule.
 12. Materials and compaction testing company shall be selected by the Owner. The Architect will notify the Contractor of the company and of the specific testing to be done. Based on these instructions, the Contractor will be responsible for notifying the testing company of individual tests to be made.
 13. Notify Architect, Structural Engineer, and Testing Laboratory twenty-four (24) hours prior to pouring footings. Pours shall always be the maximum that can be properly handled in a day.
 14. Inspection Reports from Architect or Engineers pointing up defective or unacceptable work shall be corrected immediately. Failure to do so will be cause to withhold monthly progress payments.
 15. Each Separate Prime Contractor shall be responsible for removing his own waste material and job debris from the all construction areas and the site, fully coordinated with requirements of the Construction Waste Management Plan (CWMP). This shall be done continually. Failure to keep job site clean and safe for maximum working efficiency will be cause to withhold monthly progress payments. Failure to comply with the Construction Waste Management Plan (CWMP) will be cause to withhold monthly progress payments.
 16. Construction workers will be properly dressed at all times on the site (shirts, shoes, etc.), and the use of foul language, vulgar or lewd gestures, or any other conduct deemed inappropriate by the Owner will be cause for immediate dismissal.
 17. Working Schedule: Working hours shall be coordinated among all Prime Contractors. Advise Owner and Architect.
 18. Claims: Follow General Conditions, as amended, for any claims for additional money or time. Claim must be made at time of discovery, time limits in accordance with these Conditions.
 19. Final Inspection of Projects: It is the Contractor's responsibility to notify the Architect that the project is complete and to submit a list of discrepancies to be corrected. Following such notification, the Architect shall make a preliminary review of the project to verify completion. From the preliminary review, the Architect shall prepare a punch list of discrepancies for the Contractor. Upon notification by the Contractor that the discrepancies have been rectified, the Architect shall schedule a formal final inspection with the Owner.
 20. Record Drawings: One (1) complete set of working drawings will be placed on the job site by the Architect. These drawings will be entrusted to the care of the General Contractor. If any changes or deviations from these drawings are made by any Contractor, such Contractor shall indicate the change on the drawings using colored pencils or ink.

21. Safety Regulations: All Contractors shall abide by current OSHA Regulations at all times. Be advised that the Owner is obligated by these Regulations to report any known violations to OSHA.
22. Smoking is prohibited and not allowed on the construction site property.

DRAWINGS AND SPECIFICATIONS

The following principles shall govern the settlement of disputes which may arise over discrepancies in the contract documents.

1. As between written figures given on drawings and the scale measurements, the figures shall govern.
2. As between large-scale drawings, and small scale drawings, the larger scale drawings shall govern. Discrepancies noted shall be reported to the Architect before commencing work.
3. Where more than one item or procedure is specified or indicated, the Contractor shall provide the item of greatest expense or most stringent procedure.

Titles to divisions and paragraphs in the contract documents are introduced merely for convenience and shall not be taken as a correct or complete segregation of the several units of materials and labor. The Contractor shall see that each subcontractor is familiar with the entire work under this contract to the extent that it affects his portion of the work, as no responsibility is assumed by the Architect for omissions or duplications by the Contractor or his subcontractors due to real or alleged error in arrangement of material in these documents.

The plans and specifications are both a part of this contract and shall be considered cooperative. Any work called for by the plans and not hereinafter specified or vice versa, shall be executed by the Contractor as if specifically mentioned in both.

The drawings and specifications are to be used for this building only and are the property of the Architect; they are to be returned to him before the final certificates are given.

After award of Contract, drawings and specifications shall be obtained and /or downloaded by the General Contractor from the Hite Associates website, www.hiteassoc.com. Additional drawings and / or specifications may be purchased by contacting Speedyblue Reprographics at (252) 758-1616, print@speedyblue.com.

INTENT OF DRAWINGS

In making a Proposal, the Contractor acknowledges that the drawings are diagrammatic in nature, and agrees to provide complete and finished construction assemblies to comply with the Architect's intent and pertinent Building Codes, whether all parts or components of such assemblies are shown or not (for example, doors or frames shown on plan drawings but not scheduled or detailed otherwise shall be furnished, consistent with other doors or frames of type and material as would be reasonably inferable, complete with hardware).

STANDARD OF QUALITY, CONTRACT DEFINITION

The Standard of quality for all work shall be first class in all respects, in the opinion of the Project Architect and Project Engineer. In submitting a Bid, the Contractor agrees to abide by this Standard, and no other. Any work considered less than first class by the Architect/Engineer shall be corrected or removed and replaced as directed.

PROJECT MANAGER AND SUPERINTENDENTS, APPROVAL OF PERSONNEL

The Contractor shall provide resumes of proposed Project Manager and Superintendents to Owner, through Architect, for review and approval prior to assignment. Contractor shall submit only those candidates with a minimum of five years experience in the respective capacities proposed, with projects of similar size and scope.

FIELD SUPERVISION REQUIREMENTS

The Contractor is required to provide a full time Field Superintendent to supervise the work of their Contract and to be present, in the field, and not in a field office, at all times work is being performed by that Contractor or his Subcontractors, for the express purpose of providing continuous control of the quality and correctness of construction. In addition, the Contractor's Field Superintendent is required to provide general supervision and coordination of the work of all other Prime Contractors. This person is required to be equipped with a mobile telephone at all times. The Contractor shall issue daily electronic update reports via e-mail.

FIRE RATED CONSTRUCTION ASSEMBLIES

Where U.L., F.M., W.H.I., or other independent testing agency fire rated construction assemblies are referenced on the drawings, it shall be the Contractor's responsibility to meet the specific requirements of the assembly, as defined by State and Local Building Authorities.

MEASUREMENTS AND DIMENSIONS

Before ordering material or doing work which is dependent for proper size or installation upon coordination with building conditions, the Contractor shall verify all dimensions by taking measurements at the building and shall be responsible for the correctness of same. No consideration will be given to any claim based on differences between the actual dimensions and those indicated on the drawings. Any discrepancies between the drawings and/or the specifications and the existing conditions shall be referred to the Architect for adjustment before any work affected thereby is begun.

SAMPLES AND SHOP DRAWINGS

Each Contractor shall submit such samples of materials and examples of workmanship as are requested by the Architect to show quality and kind of material and work he proposes to deliver or perform in executing his contract.

Shop drawings shall be submitted in electronic encrypted PDF format where required.

Coordinate LEED submittals with general submittal requirements. Refer to Section 01405 LEED Requirements.

Contractors shall make all submittals promptly after award of contract. Submittals requiring color selection shall be made no later than 60 days after award of contract.

All material requiring color selection shall be submitted for review before any colors are selected. The Contractor shall allow 45 days after all submittals are made for the Owner to make selections, and schedule his submittals accordingly.

OWNER SYSTEM TRAINING SESSIONS

Each Contractor shall have factory trained and certified product representatives provide equipment and system training sessions for the Owner for each product and system. Sufficient training shall be provided to the extent that each Owner attendee is fully versed on the product and/or system and can be a designated "trained" participant, and that each participant can demonstrate the ability to operate each product and system in total variety of operations. Provide multiple training sessions if such is required to be certified as fully trained personnel. An Owner Training Certification is to be provided. Submit an affidavit that each required Owner training session has been performed. Submitted affidavit to include

sign-up log of attendees/trainees and description of system or product, cross referenced to the specific contract document.

TEMPORARY FACILITIES

This section covers the furnishing of all appliances, labor, materials, tools, transportation and services required to perform and complete all preliminary work and temporary construction required for the building and site as indicated.

Storage - Each Contractor shall provide such temporary structures as are required for the protection of persons and property. On barricades where necessary, lights shall be maintained at night.

Field Office - General Contractor shall provide and maintain a full time field office construction trailer at the site, equipped with heat, lights, plan desks and telephones. Office shall be sufficient size for use by this Contractor and for on-site meetings with a separate office provided specifically for the Architect's Representatives.

Scaffolds, Tolls, etc. - Each Contractor shall erect and provide all necessary platforms and scaffolds of ample strength required for the handling of materials and equipment such as ladders, horses, poles, planks, ropes, wedges, centers, etc.

Staging: The location of trailers and material storage areas shall be approved by the Architect. Each Prime Contractor will be responsible for repair and testing of the paving base if damaged by his staging activities.

Temporary and Permanent Utilities - The General Contractor shall furnish at his own expense all water, electrical power and lighting, and other utilities necessary for construction purposes by all Prime Contractors. Temporary electric service panels shall be provided and installed by the Electrical Contractor as coordinated with the Architect. Contact Vickie Poe at Duke Progress Energy for specific temporary power requirements.

Working Hours: Single or separate prime contractors may set their own working hours, provided, however, that the Project is under supervision by the General Contractor at all times work is being performed.

Sanitation: The General Contractor shall provide and maintain temporary toilets as necessary for use of all workmen. Locate toilets where directed, keep in sanitary condition, and comply with the requirements of the local public health authority.

OSHA

It shall be the responsibility of all contractors to conform to the latest edition of Safety Standards for construction by "OSHA".

CUTTING AND PATCHING

All cutting and patching throughout Project shall be done by the trade requiring the cut. Patching of work or areas affected by cutting, digging and fitting shall be done by mechanics skilled in the applicable trades and shall match surrounding or adjoining similar work. If the quality of the cutting and patching work is not first class and, in the opinion of the Architect, not acceptable, the Contractor will be required to have this work done by the General Contractor, who will be reimbursed for the cost thereof.

CLEANING UP

Each Prime Contractor shall be responsible for keeping the project clean and free of hazardous working conditions. Remove scrap or surplus materials and keep stored materials in a neat and orderly fashion, minimum once weekly.

The General Contractor shall advise all subcontractors and separate prime contractors of their responsibility to keep their part of the project clear and free of accumulated debris.

After completion of Utility Platforms and Main Boiler and Electrical Room construction by all contractors, the General Contractor shall provide a complete vacuuming and wipe down of all mechanical and electrical equipment, including ductwork. The General Contractor shall then provide two coats of clear polyurethane floor sealer as specified to these spaces, after approval of the condition of each space by the Architect.

At the completion of work, the entire project shall be left clean and ready for occupancy. All finished surfaces shall be cleaned, polished, waxed and left in first class condition.

CONSTRUCTION WASTE MANAGEMENT: WASTE AND RECYCLING

The General Contractor shall be responsible for developing and implementing a Construction Waste Management Plan (CWMP) that identifies the materials to be diverted from disposal and their quantities by weight in order to divert a minimum of 75% of all construction and demolition debris. The GC shall submit monthly progress reports indicating quantities disposed and quantities diverted along with each Payment Application. The GC shall also be responsible for providing separate recycling collection containers for disposal and recycling of non hazardous construction and demolition waste. All containers must be clearly labeled with a list of acceptable and unacceptable materials that meet the requirements of the recovery facility or recycling processor, to which the materials shall be hauled. The General Contractor shall provide on site instruction of appropriate separation, handling, and recycling, and return methods to be used by all contractors. These containers shall be maintained on a regular schedule by either the GC or a GC contracted service. If the contracted service provides off-site sorting services, then waste may be commingled on site per the contracted services specifications. If commingling on site is not permitted, then containers are to be provided for the following materials:

1. Concrete waste
2. Brick and CMU (shall be recycled)
3. Wood and Wood Products
4. Cardboard (shall be recycled)
5. Steel and Metals (shall be recycled)

PROJECT CLOSEOUT

Prior to issuance of a Certificate of Final Payment, each Prime Contractor will be required to deliver to the Architect the following items, in triplicate, each total copy indexed and bound in (3) individual 3-ring binders separately:

1. Certificate Of Occupancy issued by the jurisdiction having authority.
2. Fully executed final Change Order, reconciling all project allowances.
3. Submit five (3) copies of Final Application for Payment, AIA Documents and Final Sales Tax Report collated and stapled together.
4. AIA Document G 706/Contractors Affidavit of Payment of Debts and Claims, and AIA Document G 706 A/Contractors Affidavit of Release of Liens, properly executed, notarized, with no exceptions.
5. Consent of Surety to Final Payment.
6. Certificate of Compliance. Each Prime Contractor shall furnish the Architect in triplicate a certificate, duly notarized, stating that he has constructed his part of the work of the project in complete compliance with the Drawings and Specifications.

7. Each Prime Contractor shall furnish to the Owner through the Architect in triplicate a certificate, duly notarized, stating that "no hazardous materials, including lead, asbestos, or PCBs, have been used in the work of the Contract".
8. Each Prime Contractor shall furnish to the Owner through the Architect in triplicate, duly notarized, an unconditional Warranty to guarantee his work free from defects in materials and workmanship for a period of one year following Substantial Completion.
9. Operations and Maintenance Manuals indexed and submitted in electronic file format, hyperlinked to the Table Of Contents.
10. As-Built drawings. Each prime contractor shall deliver to Architect one complete set of as-built drawings. Changes in the work shall be marked in red on a new set of drawings.
11. Transmittal of keys to Principal, acknowledgement signed by Principal, and Finish Hardware Bitting List.
12. Owner Training Certification: Submit affidavit that each required Owner training session has been performed. Submitted affidavit to include sign-up log of attendees and description of system or product cross referenced to the specific contract document.
13. Process and deliver to the Architect all product guarantees and warranties, materials and testing certificates, etc., as required by various sections within these specifications and by various agencies having jurisdiction over the Work, indexed and bound in the 3-ring binders.

Division 1: GENERAL REQUIREMENTS

Section 01040 – General Requirements and Construction Schedule

- A. Final List of Material Suppliers and Subcontractors with all changes incorporated, (names, addresses, phone numbers, emergency phone numbers)
- B. Final Color Schedule

Section 01050 - Special Conditions for Utilities Construction

- A. Record Drawings of Utilities construction
- B. Copy of all easements with documentation of recording with Register Of Deeds
- C. Sewer system extension work certification by Professional Engineer
- D. Water system extension work certification by Professional Engineer

Division 2: SITE WORK

Section 02281 – Termite Control

- A. 5 year termite control warranty

Section 02713 – Water Mains

- A. Sealed and signed Record Drawings of water mains final installation
- B. Water mains chlorination and bacteriological test results/certifications

Section 02730 – Gravity Sanitary Sewer System

- A. Visual Inspection Certification
- B. Leakage Testing Inspection Certification
- C. Mandrel Deflection Testing Certification
- D. Manhole Testing Certification

Section 02730 – Gravity Sanitary Sewer System

- A. Force Main Testing Certifications

Division 7: THERMAL AND MOISTURE PROTECTION

Section 07218 – Sprayed-On Acoustical Insulation

- A. Manufacturer's asbestos free material certification

Section 07610 – Metal Roofing

- A. Contractor's 20-year weather tightness warranty
- B. Manufacturer's 20-year perforation warranty

- C. Manufacturer's 20-year paint film warranty
- D. Independent third party inspection report
- E. Independent third party inspector's qualifications certificate

Section 07900 – Joint Sealers

- A. 3-year guarantee, workmanship, materials, airtightness, watertightness

Division 8: DOORS AND WINDOWS

Section 08200 – Wood Doors

- A. Manufacturer's lifetime guarantee

Section 08210 – FRP Doors and Frames

- A. Manufacturer, contractor and installer's 10-year material and workmanship guarantee
- B. Affidavit for delivery of adjustment tools and instruction sheets.
- C. Affidavit for in-service session with Owner
- D. One year labor warranty for in-service, adjustment tools and instruction sheets

Section 08410 – Aluminum Swing Entrances

- A. Manufacturer's and installer warranty
- B. Project record documents
- C. Operations and maintenance data on installed materials
- D. Manufacturer's statement of available Field Services upon request

Section 08418 – Aluminum Storefront Systems

- A. Project record documents
- B. Manufacturer's 5-year warranty
- C. Manufacturer's statement of available Field Services upon request

Section 08500 – Aluminum Windows

- A. Manufacturer's warranty; 2-year window, 5-year glass, 1-year defects

Section 08700 – Finish Hardware

- A. Affidavit for delivery of tools, instructions and maintenance information.
- B. Two copies of Job Use Finish Hardware Schedule
- C. Affidavit certifying in-service sessions performed with Owner
- D. Affidavit certifying dated appointments with Owner for 6-month Service and Report field visit.

Section 08710 – Electrified Finish Hardware

- A. Manufacturer's one year defects warranty
- B. Affidavit certifying extra materials delivered to Owner
- C. Affidavit certifying specified training performed.

Section 08800 – Glass and Glazing

- A. 5-year glass leakage and seal guarantee
- B. One year replacement warranty

Division 9: FINISHES

Section 09300 – Tile

- A. Affidavit certifying specified extra stock was accepted by the Owner

Section 09510 – Acoustical Ceilings

- A. Manufacturer's 15-year humidity no-sag warranty
- B. Affidavit certifying specified extra stock was accepted by the Owner

Section 09624 – Elastic Vinyl Gymnasium Flooring

- A. Manufacturer's maintenance instructions
- B. Manufacturer's 15-year wear warranty
- C. 2-year workmanship and defects warranty
- D. Affidavit certifying dated appointments with Owner for 1-month Inspection prior to warranty expiration
- E. Manufacturer/supplier/installer maintenance instructions demonstration

Section 09650 – Resilient Flooring

- A. Maintenance manuals
- B. Affidavit certifying specified extra stock was accepted by the Owner

Section 09656 - Resilient Terrazzo Tile

- A. Manufacturer's maintenance manuals

- B. 20-year wear warranty
 - C. 20-year workmanship and defective material warranty
 - D. Affidavit certifying specified extra stock was accepted by the Owner
- Section 09780 – Carpeting
- A. Lifetime workmanship and material guarantee

Division 10: SPECIALTIES

- Section 10100 – Markerboards, Chalkboards and Tackboards
- A. Lifetime material warranty
- Section 10536 – Awnings and Awning Frames
- A. 5-year loss of strength or color material warranty
- Section 10615 – Demountable Gypsum Panel partitions
- A. Contractor agreement to maintain renovations and additions materials
 - B. Manufacturer's one year standard warranty
- Section 10655 - Folding partitions
- A. Manufacturer's one year materials and workmanship warranty
 - B. Affidavit certifying Owner's demonstrations and training performed
 - C. Maintenance manuals

Division 11: EQUIPMENT

- Section 11200 - Kitchen Equipment
- A. Affidavit certifying manufacturer's In-Service sessions for all kitchen equipment performed and completed with Owner
 - B. One year parts and labor warranty
 - C. Operations and maintenance manuals
- Section 11450 – Residential Kitchen Equipment
- A. Manufacturer's standard warranty
- Section 11780 – Video Monitor Mounting Equipment
- A. Mounting bracket 5-year workmanship and materials warranty

Division 12: FURNISHINGS

- Section 12110 – Library and Admin Area Furnishings
- A. Bidders one year workmanship and materials warranty

Division 13: SPECIAL CONSTRUCTION

- Section 13900 – Fire Protection – Wet Pipe System
- A. Bidders one year workmanship and materials warranty

Division 15: MECHANICAL

- Section 15000 - General Provisions for Plumbing and HVAC
- A. Bidders one year workmanship and materials warranty
- Section 15170 - Motors
- A. Commissioning Inspection for vibration, noise, unusual conditions.

Division 15A: PLUMBING

- Section 15200 - Water Supply Systems
- A. Cleaning, primer painted
 - B. Chlorination, County Health Dept Approval
 - C. Pressure Testing
 - D. Verification of proper operation of heat tape
 - E. Pipe and Valve Identification
- Section 15250 - DWV Piping Systems
- A. Pressure Testing
 - B. Video Tape Entire Sanitary Sewer System, with Engineer and Owner representative on site.
- Section 15260 - Kitchen Sanitary DWV
- A. Pressure Testing

- B. Video Tape Entire Sanitary Sewer System, with Engineer and Owner representative on site.
- Section 15400 - Plumbing Fixtures
 - A. Commissioning, adjusting, cleaning, sealing
 - B. Set minimum 6" stream at all EWC.
- Section 15430 - Domestic Water Heaters
 - C. Set T-stats, coordinate EMS control with MC.

Division 15B: HEATING, VENTILATION & AIR CONDITIONING

- Section 15500 - Mechanical Insulation
 - A. Commissioning
 - B. One year from startup not to exceed 24 months, workmanship and materials warranty
- Section 15550 - Boilers & Associated Equipment
 - A. Boiler Certificate of Inspection – NC Department of Labor
 - B. Commissioning
 - C. One year from startup not to exceed 24 months, workmanship and materials warranty
- Section 15630 - Split System Heat Pumps
 - A. One year workmanship and materials warranty, Five year non-prorated compressor warranty
 - B. Provide one year supply of 2" disposable filters
- Section 15635 - Split System A/C Units
 - A. One year workmanship and materials warranty, Five year non-prorated compressor warranty
- Section 15682 - Air-Cooled Rotary Liquid Chiller
 - A. Operation and Maintenance manuals, including startup instructions
 - B. Two days factory trained representative to supervise testing, start-up and instruction on operation and maintenance to owner.
 - C. Provide commissioning Report as outline in specifications.
 - D. Furnish service and maintenance of the complete assembly for one year from Date of Substantial Completion.
 - E. Bidders two year parts and labor, five year warranty on motors, transmission, compressor, not to exceed 72 months from shipping date.
- Section 15730 - Refrigeration Piping System
 - A. Testing, 1½ maximum operating pressure for 24 hours
- Section 15735 - Condensate Piping System
 - A. Testing fill all condensate pans and allow to drain verify no leaks are in the system.
- Section 15740 - Hydronic Piping Systems
 - A. Provide welder's certification
 - B. Identification
- Section 15745 - Water Treatment Systems
 - A. Retest water system prior to 11 month warranty inspection. Make required corrections and submit to report to Architect.
- Section 15750 - Pumps & Hydronic Accessories
 - A. Commissioning
 - B. One day startup and training on operations and maintenance for owner.
 - C. Bidders one year workmanship and materials warranty, not to exceed eighteen months from shipping to the job site.
- Section 15800 - Air Distribution and Accessories
 - A. Clean Duct System per Section
- Section 15955 - Energy Management System
 - A. Commissioning report
 - B. Training
 - C. Additional training for next four years per section.
 - D. Bidders one year workmanship, labor and materials warranty
 - E. Two year warranty on all DDC controllers, valves, and actuators
 - F. 16 hours of on-site adjustment 9 months after Date of substantial completion.
- Section 15963 - Control Valves and Actuator Systems

- A. Commissioning
- B. Bidders two year unconditional warranty
- Section 15966 - Pump Systems Control
 - A. Demonstration per section
 - B. Training per section
 - C. Bidders one year workmanship and materials warranty
- Section 15975 - Electrical Work
 - A. Bidders one year workmanship and materials warranty
- Section 15980 - Testing & Balancing Procedure
 - A. Perform and report activities per section
- Section 15990 - Systems Commissioning
 - A. Maintenance and operations manuals
 - B. Wiring diagrams
 - C. Warranties
 - D. Contact phone numbers and personnel
 - E. Parts Lists
 - F. Instruction and training

Division 16: ELECTRICAL

- Section 16400 – Service and Distribution
 - A. Provide Equipment Identificaiton
- Section 16804 – Fire Alarm
 - A. Test per section
 - B. Instruction as required for operating the system per section
 - C. Installers Certificate
 - D. Bidders one year workmanship and materials warranty
- Section 16900 – Tests and Project Closeout
 - A. Testing per section, include ground resistance tests.
 - B. Two complete sets of as-builts
 - C. Operating and maintenance manuals
 - D. Bidders one year workmanship and materials warranty

Division 17: INTEGRATED TECHNOLOGY SYSTEMS

- Section 17000 - General Provisions
 - A. Provide copies of applicable licenses and permits.
- Section 17100 - Integrated Communications Systems
 - A. Three Copies of operations and maintenance manuals, as built drawings, Single line diagrams.
 - B. Acceptance testing and test reports.
 - C. Bidders one year workmanship and materials warranty
 - D. 120 hours training, refer to section for requirements.
 - E. Factory Certification for 3 Craven County Employees, see section for details, include all required access to reprogramming and customizing system applications to the owner, this includes all licenses, access codes, etc.
- Section 17200 - Data Cabling Systems
 - A. Testing, reports, commissioning testing
 - B. Three sets of Operations and maintenance manuals, as built drawings, single line diagrams.
- Section 17300 - Broadband CATV
 - A. Testing and reports
 - B. Bidders one year workmanship and materials warranty
 - C. Two days training, refer to section for requirements.
- Section 17400 – Security System
 - A. Testing
 - B. Bidders one year workmanship and materials warranty
 - C. Two days training, refer to section for requirements.
- Section 17900 - Tests, Commissioning and Project Closeout

- A. Testing and reports
- B. Bidders one year workmanship and materials warranty except where noted otherwise.
- C. Two notebook sets of instructions, operating and test procedures and parts list.
- D. Two days training, refer to section for requirements.

Do not make separate submittals of the above. Incomplete submittals will be returned to the Contractor.

END OF SECTION

1. **CONFLICT OF GRADE:** It is intended that the water mains be installed with a minimum of 36"inch cover, but the contractor is notified that he will be required to install the water mains with more than 36-inch cover as required in order to avoid conflicts.
2. **THRUST RESTRAINT:** Concrete blocking shall be installed as required at all tees, bends, etc., for all pipes unless otherwise directed. No separate payment shall be made for thrust restraint.
3. **CONNECTION TO AHJ (Authority Having Jurisdiction) OWNED FACILITIES:** No connection to or alteration (including operation of valves, hydrants, etc.) of the AHJ (Authority Having Jurisdiction) facilities shall be performed without the AHJ specific approval. All pipe, valves, taps, fittings, etc. which could possibly contaminate the AHJ's facilities shall be thoroughly disinfected prior to their use. Excavations for such connections shall be kept completely dewatered and the utmost care exercised to avoid contamination of AHJ owned facilities.
4. **SALVAGE OF AHJ OWNED FACILITIES:** When project work results in removal of AHJ owned facilities and equipment, the Contractor shall be required to deliver those facilities or equipment undamaged to the AHJ's Operation Center, if requested to do so by AHJ.
5. **NOTIFYING UTILITIES COMPANIES:**
 - 5.1 In accordance with the Underground Damage Prevention Act, the Contractor shall, within a time frame of not less than 2 or no more than 10 working days prior to the start of any excavation within any public right of way or private easement areas owned by a utility company, notify each utility owner having underground utilities in the area to be excavated of the following information:
 1. Name, address, and telephone number of the person serving the notice.
 2. Name, address, and telephone number of the company that will be performing the excavation.
 3. Anticipated starting date of the excavation and duration.
 4. Type of excavation to be conducted.
 5. Location of excavation.
 6. Whether or not explosives will be used.
 7. Contractor shall notify NC One Call, Greensboro, N.C. at least 48 hours prior to commencing construction in order that existing utilities in the area may be flagged or staked. The toll-free number is 1-800-632-4949. This service will in no way relieve Contractor of his responsibility to protect and maintain all existing utilities in an operational manner. Utilities location by NC One Call is not valid after the expiration of a 10-day period beginning on the date of such location.
- 5.2 **Responsibilities during Construction:** In addition to serving notice of intent to perform excavation, the Contractor shall:
 1. Plan the excavation to avoid damage and to minimize interference with underground utilities in and near the construction area to the best of his abilities;
 2. Maintain a clearance between an underground utility and the cutting edge or point of any mechanized equipment, taking into account the known limit of control of that cutting edge or point, as is reasonably required to avoid damage; and
 3. Provide support for the underground utilities in or near the construction area, including backfill, as may be reasonably required by the utility owner for the protection of the underground utilities.
 4. When excavation by the Contractor results in known damage to an underground utility, the Owner of the utility shall be notified immediately and the utility given a reasonable time in which to repair the damage before the Contractor proceeds with excavation in the immediate area of the damage.
- 5.3 **Responsibility of Utility:** Once notified, each utility must, prior to the day designated by the

Contractor as the anticipated start date, provide the Contractor with the following information:

1. The location of the utility;
2. The location and description of all utility markers;
3. Any other information that would assist in locating the utility, including temporary markers when necessary.

- 5.4 **Failure to Respond:** If the utility fails to respond to the Contractor's notice or fails to properly locate its underground utilities, the Contractor is free to proceed with excavation. Neither the Contractor nor Owner is liable for damage to utilities if the Contractor exercises due care.

6. **CONSTRUCTION STAKE-OUT:**
The construction staking shall be performed by a Registered Land Surveyor at least twenty-four (24) hours and three hundred feet (300') in advance of construction and shall identify the party responsible for payment for same.

The staking will include waterline, valves and fire hydrant stakeout; sanitary sewer stakeout; water and sewer services; rough grade staking; curb and gutter staking; storm drainage structure staking.

7. **TRAFFIC CONTROL:** The Contractor shall be responsible for maintaining an approved traffic control plan during the course of this work. The traffic control plan implemented for this project shall be devised through a joint effort of the NCDOT and the Contractor immediately prior to construction. In all instances, however, the Contractor shall be required to furnish, place, and maintain all signs, barricades, cones, and other traffic handling devices necessary to implement the traffic control plan.

8. **PROJECT SCHEDULE:** The Contractor shall be required to furnish an anticipated schedule of work at the time of the pre-construction conference. In addition, the Contractor shall be required to furnish bi-weekly updates of the schedule of work.

9. **FINAL CLEAN-UP:** The Contractor shall clear all streets, curbs, gutters, driveways and other contract items of all dirt and debris before final inspection will be made. The Owner will not inspect the improved area until they are cleaned.

10. **USE OF A PORTION OF THE WORK:** Whenever, in the opinion of the Engineer, any portion of the work is completed, or is in an acceptable condition for use, it shall be used for the purpose intended. Such use shall not be held in any way as an acceptance of that portion of the work used, or as a waiver of any of the provisions of these specifications. Necessary repairs or renewals in any section of the work due to defective materials, defective workmanship, or natural causes, under the instructions of the Engineer shall be performed by the Contractor at no additional cost to the Owner.

11. **SPECIAL AREAS:** Special access to construction other than existing easements or rights-of-ways shall be the responsibility of the Contractor and he shall be liable for all special agreements.

12. **MOBILIZATION:** Shall be accomplished in accordance with Section 800 of the N.C. State Highway Specifications for Roads and Structures except that there will be no compensation for mobilization as a line item.

13. **TEMPORARY TOILETS:** Provide temporary toilet facilities for use of all workmen. Insure temporary toilet facilities comply with local and State sanitation laws and regulations. Use of existing facilities by Contractor is not permitted.

14. **DRAWINGS SHOWING CHANGES DURING CONSTRUCTION:** The Contractor shall maintain a set of plans and specifications marked "Construction Record Drawings". The Contractor shall keep a complete and up-to-date record in red pencil of any and all changes made during

construction. This set of Contract Documents shall be submitted to the Engineer and approved by him prior to the Engineer recommending final payment.

15. **PRECONSTRUCTION CONFERENCE:** Conference shall be held in the AHJ at a designated place, after acceptance of proposals. Engineer will notify Contractor of time and date of meeting.

Prior to commencing any water or sewer extension construction work, the Department Engineer shall be contacted to schedule a preconstruction conference. No construction shall occur until after the preconstruction conference is held.

16. **WORK IN NORTH CAROLINA RIGHT-OF-WAY:** A bond shall be posted with the State of North Carolina for ten percent (10%) of the cost of construction within the right-of-way. This bond shall be posted prior to commencement of work.

17. **NORMAL WORK HOURS:** Unless special written consent is issued by the AHJ, all construction shall be performed during the regular office hours of the AHJ, i.e. 8:00 a.m. to 5:00 p.m. After hours, holiday, or weekend work should include only such tasks that do not require observation by the AHJ's Representative. Under certain conditions, the AHJ may agree to provide construction observation after hours or on weekends and holidays. The Contractor shall bear the costs of provision of such construction observation.

18. **OPERATION OF EXISTING FACILITIES:**

1. The Contractor performing water or sewer extension work shall contact the Department Engineer whenever operation of the AHJ's valves or hydrants is necessary to request scheduling of such operation. The AHJ shall require the Contractor to estimate the length of time service will be interrupted and the number of customers to be affected.

2. Facilities and equipment belonging to the AHJ may not be operated or adjusted without the express permission of the AHJ's Representative. In the case of any emergency, the Contractor shall be allowed to take such steps with valves and hydrants as necessary for the protection of life and property.

3. Valves which control networks not yet accepted but which are connected to the existing system shall be considered system valves. Valves within a network not yet accepted and which do not control the flow of water between new and existing systems are not considered system valves and do not require permission to operate.

4. Notification to the AHJ must be made by the Contractor upon breakage of any AHJ maintained water or sewer line or appurtenance thereof. Repair of the AHJ's facilities shall be made by the Contractor upon approval of the Department Engineer. Any repairs made with AHJ forces will be billed to the contractor at cost.

5. Where interruption of service is required, the AHJ shall be notified to request approval and subsequent scheduling of such interruption. The AHJ shall notify the affected customers should the interruption be approved.

19. **Project Close-out:**

A.. Pre-final Inspection: upon the completion of construction, the Contractor or Developer shall contact the AHJ to schedule a pre-final inspection. A pre-final inspection will not be scheduled until the following requirements are met:

- a. The work shall be in accordance with the requirements of the AHJ.
- b. A copy of the final estimate has been submitted and approved by the AHJ.
- c. The easements and dedicated property required for the work by this Manual have been obtained and are recorded at the Register of Deeds.

- d. The As- built drawings for the work have received the approval of the Department Engineer.
- e. All fees applicable to the project have been received by the AHJ.
- f. When a project includes sewer system extension(s), the AHJ has received certification by a Professional Engineer stating that the sewer system installation conforms with the requirements of the approved Contract Documents as required by Section .0219 of the DEHNR regulations (G.S. 143-215.1).
- g. When a project includes water system extension(s), the AHJ has received certification by a Professional Engineer stating that the water system installation conforms with the requirements of the approved Contract Documents as required by Section .0903 of the NCDHS regulations (G.S. 130A-315; 130A-317).

At the scheduled pre-final inspection, the Department Engineer shall perform a visual inspection in the presence of the representatives of the Contractor and the Engineer. The Engineer or his representative shall prepare a detailed punch list of any deficiencies discovered and provide copies to the Developer, Contractor, and the AHJ. Any defective items noted shall be corrected prior to acceptance.

B. Final Inspection: upon completion of the items on the punch list, the Contractor or Developer shall contact the AHJ to schedule the final inspection. Any remaining defective items shall be noted and corrected prior to acceptance. No service shall be provided prior to project acceptance.

*****END OF SECTION*****

GENERAL

CASH ALLOWANCES:

The following is a list of cash allowances to be provided in bids. Non-fee items include labor, tax, and freight, except as noted. The Owner reserves the right to bid the work or select subcontractors, or to credit any allowance at full value to remove the work from the Contract.

*(** Does not include labor or installation, to be provided by GC, unless otherwise noted)*

General Contract:	Testing and Special Inspections 01062:	\$10,000
	** Signs & Owner's Bldg Equip. 10440:	\$30,000
	TOTAL	\$40,000

BUILDING PERMITS and all other permit costs shall be determined by Bidders and provided for in Bids.

MATERIAL ALLOWANCES:

1. Mass undercut for building pad areas: General Contractor shall provide in his bid 80 cubic yards of mass undercut, disposal off site, and select backfill, compacted in place, as directed by the Engineer. Specified stripping of site as indicated in Section 02110 is NOT a part of this allowance.
2. Foundation undercut: General Contractor shall provide in his bid 25 cubic yards of localized undercut installed for building foundations and floor slabs, disposal off site, with backfill of #57 or #67 washed stone, as directed by Engineer, in addition to the specific requirements on the Structural Plans.

NOTE: THESE MATERIAL ALLOWANCES WILL BE MEASURED AND MONITORED BY THE OWNER'S TESTING AGENCY. AMOUNTS NOT USED WILL BE CREDITED BACK TO THE OWNER AT THE UNIT PRICE INDICATED ON FORM OF PROPOSAL. AMOUNTS USED IN EXCESS OF THESE ALLOWANCES WILL BE CHARGED TO THE OWNER AT THE SAME UNIT PRICES.

END OF SECTION

PART 1: GENERAL

Testing laboratory services will be paid for under the cash allowance as indicated in Section 01056 Allowances, to be provided in the General Contractor's bid, as amended below.

DESCRIPTION:

Work Included: From time to time during progress of the work, the Architect may require that testing be performed to determine that materials provided for the work meet the specified requirements; such testing includes, but not necessarily limited to:

- Proofrolling, Cutting & Filling Operations
- Soil Compaction
- Cast-In-Place Concrete & Reinforcing
- Structural Steel & Decking Connections
- Masonry Reinforcing
- Exterior Wall Light Gauge Framing
- Fireproofing

Related work described elsewhere: Requirements for testing may be described in various sections of these specifications and Drawings; where no testing requirements are described but the Architect decides that testing is required, the Architect may require testing to be performed under current pertinent standards for testing.

Work not included: Selection of testing laboratory: The Architect will select a pre-qualified independent testing laboratory and / or consultant.

QUALITY ASSURANCE:

Qualifications of testing laboratory: The testing laboratory will be qualified to the Architect's approval in accordance with ASTM E-329-70 "Recommended Practice for Inspection and Testing Agencies for Concrete and Steel Used in Construction".

Codes and Standards: Testing, when required, will be in accordance with all pertinent codes and regulations and with selected standards of the American Society for Testing and Materials.

PRODUCT HANDLING:

Promptly process and distribute all required copies of test reports and related instructions to ensure all necessary retesting and/or replacement of materials with the least possible delay in progress of the work.

PART 2: PRODUCTS

PAYMENT FOR TESTING SERVICES:

Initial Services: All testing services shall be paid for by the General Contractor through an allowance per Section 01056 Allowances.

Retesting: When initial tests indicate non-compliance with the contract documents, all subsequent retesting occasioned by the non-compliance shall be performed by the same testing laboratory and the costs thereof will be paid for by the Contractor and not charged to the Owner for Testing.

PART 3: EXECUTION

COOPERATION WITH TESTING LABORATORY:

Representatives of the testing laboratory shall have access to the work at all times; provide facilities for such access in order that the laboratory may properly perform its function.

SCHEDULES FOR TESTING:

Establishing Schedule: By advance discussion with the testing laboratory selected by the Architect, determine the time required for the laboratory to perform its tests and to issue each of its finding.

Provide all required testing time within the construction schedule.

Revising Schedule: When changes of construction schedule are necessary during construction coordinate all such changes of schedule with the testing laboratory as required.

Adherence to Schedule: When the testing laboratory is ready to test according to the determined schedule but is prevented from testing or taking specimens due to incompleteness of work, all extra costs for testing attributable to the delay may be back-charged to the Contractor and shall not be charged to the Owner.

END OF SECTION

ABBREVIATIONS AND NAMES: The following acronyms or abbreviations as referenced in contract documents are defined to mean the associated names. Both names and addresses are subject to change, and are believed to be, but are not assured to be, accurate and up-to-date as of date of contract documents:

AA	Aluminum Association 818 Connecticut Ave. NW; Washington DC 20006; 202/862-5100
AAMA	Architectural Aluminum Manufacturers Association 35 E. Southern Bldg.; Washington DC 20005; 202/737-4060
AAN	American Association of Nurserymen 230 Southern Bldg.; Washington, DC 20005; 202/737-4060
AASHTO	American Association of State Highway and Transportation Officials 444 North Capital St.; Washington DC 20001; 202/624-5800
AATCC	American Association of Textile Chemists and Colorists P. O. Box 12215; Research Triangle Park, NC 27709; 919/549-8141
ACI	American Concrete Institute P. O. Box 19150; Detroit, MI 48219; 313/532-2600
ACIL	American Council of Independent Laboratories 1725 K St., NW; Washington DC 20006 202/659-3766
ADC	Air Diffusion Council 230 N. Michigan Aven.; Chicago, IL 60601; 312/372-9800
AGA	American Gas Association 1515 Wilson Blvd., Arlington, VA 22209; 703/841-8400
AHAM	Association of Home Appliance Manufacturers 20 N. Wacker Dr.; Chicago, IL 60606 312/984-5800
AI	Asphalt Institute Asphalt Inst. Bldg.; College Park, MD 20740 301/277-4258
AIA	American Institute of Architects 1735 New York Ave., NW; Washington, DC 20006; 202/626-7474
A.I.A.	American Insurance Association 85 John St.; New York, NY 10038; 212/699-0400

AISC	American Institute of Steel Construction 400 N. Michigan Ave.; Chicago, IL 60611; 312/670-2400
AISI	American Iron and Steel Institute 1000 16th St., NW; Washington, DC 20036; 202/452-7100
AITC	American Institute of Timber Construction 333 W. Hampden Ave.; Englewood, CO 80110; 303/761-3212
AMCA	Air Movement and Control Association 30 W. University Dr.; Arlington Heights, IL 60004; 312/394-0150
ANSI	American National Standards Institute 1430 Broadway; New York, NY 10018; 212/354-3300
APA	American Plywood Association P. O. Box 11700; Tacoma, WA 98411; 206/565-6600
ARI	Air Conditioning and Refrigeration Institute 1815 N. Fort Myer Dr.; Arlington, VA 22209; 703/524-8800
ASC	Adhesive and Sealant Council 1600 Wilson Blvd.; Arlington, VA 22209; 703/841-1112
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers 1791 Tullie Circle, NE; Atlanta, Ga 30329 404/636-8400
ASME	American Society of Mechanical Engineers 345 East 47th St.; New York, NY 10017; 212/705-7722
ASPE	American Society of Plumbing Engineers 15233 Ventura Blvd.; Sherman Oaks, Ca. 91403 213/783-4845
ASSE	American Society of Sanitary Engineering P. O. Box 9712; Bay Village, OH 44140 216/835-3040
ASTM	American Society for Testing and Materials 1916 Race St.; Philadelphia, CA 19103 215/299-5400
AWI	Architectural Woodwork Institute

	2310 S. Walter Reed Dr.; Arlington, VA 22206 703/671-9100
AWPA	American Wood-Preserver's Association 7735 Old Georgetown Rd.; Bethesda, MD 20814 301/652-3109
AWPB	American Wood Preservers Bureau P. O. Box 6085; Arlington, VA 22206 703/931-8180
AWS	American Welding Society P. O. Box 351040; Miami, FL 33135 305/642-7090
AWWA	American Water Works Association 6666 W. Quincy Ave., Denver, CO 80235 303/794-7711
BHMA	Builders' Hardware Manufacturers Association (c/o TGAM) 60 East 42nd St.; New York, NY 10017 212/682-8142
BIA	Brick Institute of America 1750 Old Meadow Rd.; McLean, VA. 22102 703/893-4010
CDA	Copper Development Association 405 Lexington Ave.; New York, NY 10174 212/953-7300
CE	Corps of Engineers (U.S. Dept. of the Army) Washington, DC 20314
CFR	Code of Federal Regulations Available from Government Printing Office; Washington, DC 20402 (usually first published in Federal Register)
CISPI	Cast Iron Soil Pipe Institute 1499 Chain Bridge Rd., McLean, VA. 22101 703/827-9177
CRIGLP	CRI Green Label Plus 730 College Drive Dalton, GA 30720 706-278-3176
CRSI	Concrete Reinforcing Steel Institute 933 Plum Grove Rd., Schamburg, IL 60195 312/372-5059
CS	Commercial Standard of NBS (U.S. Dept. of Commerce) Government Printing Office; Washington, DC 20402

DHI	Door and Hardware Institute 7711 Old Springhouse Rd., McLean, VA. 22102 703/556-3990
EIA	Electronic Industries Association 2001 Eye St., NW; Washington, DC 20006 202/457-4900
FAA	Federal Aviation Administration (U. S. Dept. of Transportation) 800 Independence Ave., SW; Washington, DC 20590
FCC	Federal Communications Commission 1919 M St., NW; Washington, D C 20554 202/632-7000
FCI	Fluid Controls Institute U.S. Highway One, Plaza 222; Tequesta, FL 33458; 305/746-6466
FGMA	Flat Glass Marketing Association 3310 Harrison; Topeka, KS 66611; 913/266-7013
FHA	Federal Housing Administration (U. S. Dept. of HUD) 451 - 7th St., SW; Washington, D C 20201
FM	Factory Mutual Engineering Corp. 1151 Boston-Providence Turnpike; Norwood, MA 02062 617/762-4300
FS	Federal Specification (General Services Admin.) Obtain from your Regional GSA Office, or purchase from GSA Specifications Unit (WFSIS); 7th and D Streets, SW; Washington, DC 20406; 202/472-2205 or 2140
FTI	Facing Tile Institute c/o Box 8880; Canton, OH 44711; 216/488-1211
GA	Gypsum Association 1603 Orrington Aven.; Evanston, IL 60201 312/491-1744
HPMA	Hardwood Plywood Manufacturers Association P. O. Box 2789, Reston, VA. 22090 703/435-2900
IEEE	Institute of Electrical and Electronic Engineers, Inc. 345 E. 47th St.; New York, NY 10017; 212/705-790
IESNA	Illuminating Engineering Society of North America 345 E. 47th St.; New York, NY 10017

	212/705-7926
ILI	Indiana Limestone Institute of America Stone City Bank Bldg.; Bedford, IN 47421; 812/275-4425
IRI	Industrial Risk Insurers 85 Woodland St.; Hartford, CT 06102; 203/525-2601
ISA	Instrument Society of America P. O. Box 12277; Research Triangle Park, NC 27709; 919/549-8411
LEED	Leadership in Energy and Environmental Design U. S. Green Building Council 1800 Massachusetts Avenue NW, Suite 300 Washington , DC 20036 (800) 795-1747
MCAA	Mechanical Contractors Association of America 5530 Wisconsin Aven.; Chevy Chase, MD 20815 202/654-7960
MIA	Marble Institute of America 33505 State St.; Farmington, MI 48024 313/476-5558
MIL	Military Standardization Documents (U.S. Dept. of Defense) Naval Publications and Forms Center 5801 Tabor Ave.; Philadelphia, PA 19120
ML/SFA	Metal Lath/Steel Framing Association 221 N. LaSalle St.; Chicago, IL 60601 312/346-1600
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry 5203 Leesburg Pike; Falls Church, VA 22041; 703/998-7996
NAAMM	National Association of Architectural Metal Manufacturers 221 N. Lasalle St.; Chicago, IL 60601 312/346-1600
NAPF	National Association of Plastic Fabricators 1701 N. St., NW; Washington, DC 20036; 202/233-2504
NBGQA	National Building Granite Quarries Association c/o H. E. Fletcher Co.; West Chelmsford, MA 01863
NBS	National Bureau of Standards (U.S. Dept. of Commerce) Gaithersburg, MD 20234 301/921-1000

NCMA	National Concrete Masonry Association P. O. Box 781; Herndon, VA 22070 703/435-4900
NEC	National Electrical Code (by NFPA)
NEII	National Elevator Industry, Inc. 600 Third Aven.; New York, NY 10016 212/986-1545
NECA	National Electrical Contractors Association 7315 Wisconsin Aven.; Bethesda, MD 20814 301/657-3110
NEII	National Elevator Industry, Inc. 600 Third Avenue; New York, NY 10016 212/986-1545
NEMA	National Electrical Manufacturers Association 2101 L St., NW; Washington, DC 20037 202/457-8400
NFPA	National Fire Protection Association Batterymarch Park; Quincy, MA 02269 617/328-9290
NFPA	National Forest Products Association 1619 Massachusetts Aven.; NW; Washington, DC 20036 202/797-5800
NHLA	National Hardwood Lumber Association P. O. box 34518; Memphis, TN 38104; 901/377-1818
NPA	National Particleboard Association 2306 Perkins Pl.; Silver Spring, MD 20910; 301/587-2204
NRCA	National Roofing Contractors Association 8600 Bryn Marr Aven.; Chicago, Il. 60631 312/693-0700
NSF	National Sanitation Foundation P. O. Box 1468; Ann Arbor, MI 48106 313/769-8010
NSSEA	National School Supply and Equipment Association 1500 Wilson Blvd.; Arlington, VA. 22209 703/524-8819
NTMA	National Terrazzo and Mosaic Association 3166 Des Plains Ave.; Des Plains, IL 60018 312/635-7744

NWMA	National Wood Manufacturers Association 205 West Touhy Avenue; Park Ridge, IL 60068; 312/823-6747
OSHA	Occupational Safety Health Administration (U.S.Dept. of Labor) Government Printing Office; Washington, DC 20402
PCI	Prestressed Concrete Institute 20 N. Wacker Dr., Chicago, IL 60606 312/346-4071
PDI	Plumbing and Drainage Institute 5342 Blvd., Pl.; Indianapolis, IN 46208 317/251-5298
PEI	Porcelain Enamel Institute 1911 N. Fort Myer; Arlington, VA 22209 703/527-5257
PS	Product Standard of NBS (U.S. Dept. of Commerce) Government Printing Office; Washington, DC 20402
RFCI	Resilient Floor Covering Institute 1030 15th St.; NW; Washington, DC 20005 202/833-2635
RIS	Redwood Inspection Service (Grading Rules) 627 Montgomery; San Francisco, CA 94111
SAMA	Scientific Apparatus Makers Association 110I 16th St., NW; Washington, DC 20036 202/223-1360
SCAQMD	South Coast Air Quality Management District 21865 Copley Drive Diamond Bar, CA 91765 (909) 396-2000
SDI	Steel Deck Institute P. O. Box 3812; St. Louis, MO 63122 314/965-1741
SDI	Steel Door Institute 712 Lakewood Cnt. N.; Cleveland, OH 44107 216/226-7700
SHLMA	Southern Hardwood Lumber Manufacturers Association 805 Sterick Bld.; Memphis, TN. 38103 901/525-8221
SIGMA	Sealed Insulating Glass Manufacturers Association 111 E. Wacker Dr.; Chicago, IL. 60601

	312/644-6610
SJI	Steel Joist Institute 1703 Parham Rd.; Richmond, VA 23229 804/288-3071
SMACNA	Sheet Metal and Air Conditioning Contractor's National Association P. O. Box 70; Merrifield, VA 22116
SPIB	Southern Pine Inspection Bureau (Grading Rules) 4709 Scenic Hwy.; Pensacola, FL 32504; 904/434-2611
SSPC	Steel Structures Painting Council 4400 5th Avenue; Pittsburgh, PA 15213; 412/578-3327
TCA	Tile Council of America P. O. Box 326, Princeton, NJ 08540; 609/921-7050
TIMA	Thermal Insulation Manufacturers Association 7 Kirby Plaza; Mt. Kisco, NY 10549; 914/241-2284
TPI	Truss Plate Institute 100 W. Church St., Frederick, MD 21701; 301/694-6100
UL	Underwriters Laboratories 333 Pfingsten Rd.; Northbrook, IL 60062; 312/272-8800
WCLIB	West Coast Lumber Inspection Bureau (Grading Rules) P. O. Box 2315; Portland, OR 97223; 503/639-0651
WIC	Woodwork Institute of California 1833 Broadway; Fresno, CA 93773; 209/233-9035
WRI	Wire Reinforcement Institute 7900 Westpark drive; McLean, VA. 22102; 703/790-9790
WSFI	Wood and Synthetic Flooring Institute 2400 E. Devon; Des Plaines, IL 60018; 312/635-7700
WWPA	Western Wood Products Association (Grading Rules) 1500 Yeon Bldg.; Portland, OR 97204; 503/224-3930

WWPA Woven Wire Products Association
 108 W. Lake St.; Chicago, IL 60601;
 312/332-6502

END OF SECTION

RELATED DOCUMENTS:

The general provisions of the Contract, including General and Supplementary Conditions, and General Requirements, and Division 1 specifications that apply to the work specified in this Section.

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this section.

DESCRIPTION OF WORK:

Extent of demolition is shown on the plans. Refer to all Drawings and project phasing requirements..

Demolition requires the removal and subsequent off-site disposal of the following but is not limited to:

- Removal of asphalt or concrete paving, with curb and guttering.

- Removal of building structures and structural elements, complete with foundations – including concrete floors/walks and exterior canopies.

- Removal of building exterior wall and roof components.

- Removal of interior walls and components.

- Removal of partitions and doors.

- Removal of windows and window walls.

- Removal of ceiling systems, floor finishes and wall finishes.

- Removal of underground elements and components; piping and accessories.

- Removal of plumbing, electrical and mechanical equipment.

- Hazardous materials abatement.

Cutting concrete floors, masonry walls and ceilings for piping, ducts, and conduit is included with the work of the respective mechanical and electrical Divisions 15 and 16 Specification Sections.

Locating and identification of existing underground utilities.

SUBMITTALS:

Demolition Schedule: Submit schedule indicating proposed methods and sequence of operations for selective demolition work to Owner's Representative for review prior to commencement of work. Include coordination for shut-off, capping, and continuation of utility services as required, together with details for dust and noise control protection.

Incorporate all selective demolition and abatement operations and phases into the Project CPM Schedule.

Coordinate with Owner's continuing occupation of portions of existing building.

JOB CONDITIONS:

Occupancy: Owner will be continuously occupying the building immediately adjacent to areas of selective demolition. Conduct selective demolition work in a manner that will minimize need for disruption of Owner's normal operations. Provide minimum of 72 hours advance notice to Owner of demolition activities which will severely impact Owner's normal operations.

Condition of Structures: Owner assumes no responsibility for actual condition of items or structures to be demolished.

Protections: Provide temporary barricades and other forms of protection as required to protect personnel and general public from injury due to demolition work.

Provide interior and exterior shoring, bracing or support to prevent movement, settlement, or collapse of structure or element to be demolished, and adjacent facilities or work to remain.

Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.

Protect floors with suitable coverings when necessary.

Construct temporary insulated solid dustproof partitions where required to separate areas where noisy or extensive dirt or dust operations are performed. Equip partitions with dustproof doors and security locks if required.

Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces, and installation of new construction to insure that no water leakage or damage occurs to structure or interior areas of existing building.

Remove protections at completion of work.

Damages: Promptly repair damages caused to adjacent facilities by demolition work at no cost to Owner.

Traffic: Conduct selective demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

Do not close, block or otherwise obstruct streets, walks or other occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

Explosives: Use of explosives will not be permitted.

Utility Services: Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations.

Environmental Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.

Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

HAZARDOUS MATERIALS

If necessary, hazardous material abatement will be performed by a separate prime contractor, with which the General Contractor shall coordinate with. Master project construction schedule shall incorporate abatement operations. Refer to and coordinate with the approved project construction schedule and the Supplementary General Conditions.

LEAD PAINT

If the building is constructed before 1978, all contractors are to assume that all painted surfaces inside the existing building may contain lead paint. The contractors are required to comply with OSHA Lead Construction Standard 29 CFR 1926.62.

All demolition debris can be disposed of at C&D landfill as long as the painted surfaces matrix has not been disturbed. For patching against the painted surfaces and painting, sanding, cutting etc. should be done by company who has received RRP certification for disturbing lead paint in a closed environment where children 6 years of age and under can enter the space during or after the work is completed. Information for RRP certification can be obtained from N. C. Health Hazard Control Unit, Raleigh, NC. Phone No. (919) 707-5950 / Don Chaney at (919) 707-5974.

Lead-Based Paint Renovation, Repair, and Painting: Firms and renovators who perform renovations in housing or child occupied facilities built before 1978 must be certified by the Health Hazards Control Unit (HHCU).

All work shall comply with requirements as published by the EPA Lead-Based Paint Renovation, Repair and Painting Rule in the Code of Federal Regulations.

Samples: For determining whether components are free of lead-based paint, certified renovators may collect paint chip samples and submit samples to a laboratory recognized by NLLAP for analysis. Required paint chip samples documentation shall be prepared and maintained by the certified renovator for three years.

At interior and exterior areas suspected to be or are tested positive for lead based paints, provide vertical containment consisting of a minimum of plastic sheeting or other impermeable material on a rigid frame, or an equivalent system of containing the work area. Vertical containment shall comply with requirements as published by the EPA Lead-Based Paint Renovation, Repair and Painting Rule in the Code of Federal Regulations.

HEPA vacuum cleaners must be designed so that all the air drawn into the machine is expelled through a HEPA filter with no air leaking past or around the filter.

Machines used to remove paint or other surface coatings through high speed operation such as sanding, grinding, power planing, abrasive blasting, or sandblasting, is prohibited on painted surfaces unless such machines have shrouds or containment systems and are equipped with a HEPA vacuum attachment to collect dust and debris at the point of generation. Machines must be operated so that no visible dust or release of air occurs outside the shroud or containment system.

PART 2 - PRODUCTS (Not Applicable)

PART 3 – EXECUTION

INSPECTION:

Prior to commencement of demolition work, inspect areas in which work will be performed. Photograph existing conditions to structure surfaces, equipment or to surrounding properties which could be

misconstrued as damage resulting from selective demolition work; file with Owner's Representative prior to starting work.

LOCATING EXISTING UNDERGROUND UTILITIES:

Prior to commencement of groundbreaking work, contractor shall provide for and retain a private utilities locating firm. All underground utilities within the construction limits shall be located, marked and identified by the private utility location service, prior to any ground breaking. All information shall be documented in a contractor's As-Built drawings format.

PREPARATION:

Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of structures to be demolished and adjacent facilities to remain.

Cease operations and notify the Owner's Representative immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.

Cover and protect furniture, equipment and fixtures to remain from soiling or damage when demolition work is performed in rooms or areas from which such items have not been removed.

Erect and maintain dust-proof partitions and closures as required to prevent spread of dust or fumes to occupied portions of the building.

Where selective demolition occurs immediately adjacent to occupied portions of the building, construct dust-proof partitions of minimum 4" studs, 5/8" drywall (joints taped) on occupied side, 1/2" fire-retardant plywood on demolition side, and fill partition cavity with sound-deadening insulation.

Provide weatherproof closures for exterior openings resulting from demolition work.

Locate, identify, stub off and disconnect utility services that are not indicated to remain.

DEMOLITION:

Perform demolition work in a systematic manner. Use such methods as required to complete work indicated on Drawings in accordance with demolition schedule and governing regulations.

Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact tools.

Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floors or framing.

Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.

If unanticipated mechanical, electrical or structural elements which conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to Owner's Representative in written, accurate detail. Pending receipt of directive from Owner's Representative re-arrange selective demolition schedule as necessary to continue overall job progress without delay.

DISPOSAL OF DEMOLISHED MATERIALS:

The Owner reserves salvage rights to equipment and material, items to be determined at pre-construction conference. At request of the Owner, Contractor shall coordinate the scheduled removal of designated material to be salvaged and place said material outside of building, on site, for removal by Owner.

Remove all debris, rubbish and other materials resulting from demolition operations and not salvaged by the Owner from building site. Transport and legally dispose of materials off-site.

Hazardous materials disposal during demolition operations, shall comply with all applicable regulations, laws, and ordinances, concerning removal, handling and protection against exposure or environmental pollution.

Burning of removed materials is not permitted on project sites.

CLEAN-UP AND REPAIR:

Upon completion of demolition work, remove tools, equipment and demolished materials from site. Remove protections and leave interior areas broom clean.

Repair demolition performed in excess of that required. Return structures and surfaces to remain to condition existing prior commencement of demolition work. Repair adjacent construction or surfaces soiled or damaged by demolition work to like new condition.

END OF SECTION

RELATED DOCUMENTS:

The general provisions of the Contract, including General and Supplementary Conditions, and General Requirements, and Division 1 specifications that apply to the work specified in this Section.

PART 1: GENERAL

DESCRIPTION OF WORK:

Extend of site clearing is shown on drawings.

Site clearing work includes, but is not limited to:

- Removal of trees and other vegetation.
- Topsoil stripping and stockpiling.
- Clearing and grubbing.

JOB CONDITIONS:

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.

Protection of Existing Improvements: Provide protection necessary to prevent damage to existing improvements indicated to remain in place.

Protect improvements on adjoining properties and on Owner's property.

Restore damaged improvements to their original condition, as acceptable to parties having jurisdiction.

PART 2: PRODUCTS

Not applicable to work of this section.

PART 3: EXECUTION

SITE CLEARING:

General: Remove trees, shrubs, grass and other vegetation, improvements, or obstructions interfering with installation of new construction. Remove such items elsewhere on site or premises as specifically indicated. Removal includes digging out stumps and roots, and backfill with suitable compacted fill material.

Topsoil: Topsoil is defined as friable clay loam surface soil found in a depth of not less than 4". Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 2" in diameter, and without weeds, roots, and other objectionable material.

Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material.

Remove heavy growths of grass from areas before stripping.

Stockpile a quantity of topsoil to allow a full 3" topsoil layer to be redistributed throughout all finish grade areas.

Stockpile topsoil in storage piles in areas shown, or where directed. Construct storage piles to freely drain surface water. Cover storage piles if required to prevent wind-blown dust.

Dispose of unsuitable or excess topsoil same as waste material, herein specified.

Clearing and Grubbing: Clear site of trees, shrubs and other vegetation, except for those indicated to be left standing.

Removal of Improvements: Remove existing above-grade and below-grade improvements necessary to permit construction, and other work as indicated.

DISPOSAL OF WASTE MATERIALS:

Burning on Owner's Property: Burning is allowed on the Owner's property, with proper permits.

Removal from Owner's Property: Remove waste materials and unsuitable and excess topsoil from Owner's property and dispose of off-site in legal manner.

END OF SECTION

RELATED DOCUMENTS:

The general provisions of the Contract, including General and Supplementary Conditions, and General Requirements, and Division 1 specifications that apply to the work specified in this Section.

PART 1: GENERAL

DESCRIPTION OF WORK:

Extent of earthwork is indicated on drawings.

Earthwork includes all excavation (removal of material) necessary to reach subgrade elevations indicated. This includes subsequent disposal of material. Preparation of subgrade for building pads, parking areas, access roads and storm drainage installation are included as part of this work.

QUALITY ASSURANCE

TESTING AND INSPECTION SERVICE:

All sub-grade and stone base shall be proof-rolled in accordance with NCDOT Standards and as directed by Engineer. Project Engineer shall be present at proof rolling.

CODES AND STANDARDS:

All work conducted as part of this are to be in compliance with NCDOT specifications for Roadway Construction.

SUBMITTALS:

Test Reports-Excavating: Submit following reports directly to Engineer from the testing services, with copy to Contractor:

Field density test reports on all trench backfill located beneath existing or proposed roadways.

JOB CONDITIONS:

Existing Utilities: Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.

Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner and Project Engineer immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

Do not interrupt existing utilities serving facilities occupied and used by Owner or others, during occupied hours, except when permitted in writing by Engineer and then only after acceptable temporary utility services have been provided.

Provide minimum of 48-hour notice to Engineer, Owner, and Local Government and receive written notice to proceed before interrupting any utility.

Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.

Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights.

Operate warning lights as recommended by authorities having jurisdiction.

Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

PART 2: PRODUCTS

SOIL MATERIALS

DEFINITIONS:

Satisfactory soil materials are defined as those complying with ASTM D 2487 soil classification groups GW, GP, GM, SM, SW and SP.

Drainage Fill: Washed, evenly graded mixture of crushed No. 57 - Stone.

Select Backfill: Job excavated or borrow material of coarse sands, fine sands or sandy clay mixture.

Backfill Materials: Satisfactory Class I through Class VII soil materials free of clay, rock or gravel larger than 2" in any dimension, debris, waste, frozen material, vegetable and other deleterious matter.

Excavation: Removal of material encountered to subgrade elevations and the reuse or disposal of materials removed. Refer to the following section for additional definitions and classified excavations.

Unauthorized Excavation: Removing materials beyond indicated invert/subgrade elevations or dimensions without direction by the design authority, or Owner. Unauthorized excavations, as well as associated remedial work directed by design authority or Owner, shall be at contractor's expense. Backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by design authority.

Subgrade: The uppermost surface of an excavation (after stripping is fully complete) or the top surface of a new fill or backfill immediately below base course, drainage course, walks, drainage fill, slab base materials, or topsoil materials.

Borrow: Suitable soil materials obtained from off-site when sufficient approved soil material is not available from on-site excavations.

Surface Course: The top layer of the pavement structure placed on aggregate base course, asphalt base course, or subgrade, as required.

Aggregate Base Course: Aggregate material layer placed between the subgrade elevation and asphalt paving course, meeting the requirements of Section 910-1, Paragraph (a) of "Standard Specifications for Roads and Structures" by NCDOT.

Bedding Course: Layer placed over excavated subgrade in trench bottoms before laying pipe.

Structures: Buildings, footings, foundations, retaining walls, slabs-on-grade, curbs, tanks, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground surface.

Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within building lines.

UNIT PRICES

Rock Measurement: Volume of rock actually removed, measured in original position, but not exceeding the following:

1. 24 inches outside of concrete forms other than at footings.
2. 12 inches outside of concrete forms at footings.
3. 6 inches outside of minimum required dimensions of concrete cast against grade.
4. 6 inches beneath bottom of concrete slabs-on-grade.
5. 6 inches beneath bottom of footings.
6. 6 inches beneath invert elevation of pipe and/or related structures in trenches, and the greater of 24 inches wider than outside pipe diameter, or 42 inches wide (regardless of trench box sizes). 24 inches wider than related structures in trenches.

Unsuitable Soil Measurement: Volume of unsuitable soil actually removed below subgrade elevations (as recommended and classified by Owner's Geotechnical Testing Firm) measured in-place, but not exceeding the following:

1. 24 inches outside of concrete forms other than at footings.
2. 12 inches outside of concrete forms at footings.
3. 6 inches outside of minimum required dimensions of concrete cast against grade.
4. 12 inches beneath invert elevation of pipe and/or related structures in trenches, and the greater of 24 inches wider than outside pipe diameter, or 42 inches wide (regardless of trench box sizes). 24 inches wider than related structures in trenches.
5. Minimum dimensions as recommended by Owner's Geotechnical Testing Firm in any other areas.

Unit prices for unsuitable soil and rock removal shall include all work and materials as defined in Division 1 Sections, including any required replacement with suitable fill soils or other materials, as required.

Structural Geo-Grids: Integrally Formed Biaxial Geogrid for base reinforcement and subgrade improvement formed with polypropylene polymer in roll form providing positive mechanical interlock. Provide Tensar BX1100 Geogrid.

PART 3: EXECUTION

EXCAVATION CLASSIFICATIONS:

Excavation Classifications: All excavation is classified as General Excavation except for Mass Rock, Trench Rock and Unsuitable Soil Materials as defined in this section.

General Excavation: Excavation, removal and/or disposal of pavements and other obstructions visible on surface, underground structures, utilities, and other items indicated to be demolished and/or removed; together with soil, boulders, and other materials encountered that are not classified as Mass Rock, Trench Rock, Unsuitable Soil, or unauthorized excavation.

- a. Intermittent drilling, ripping or blasting to increase production and not necessary to permit excavation of materials encountered will be considered general excavation.
- b. Soil (irregardless of nature) or other debris encountered above plan subgrade elevations shall be considered general excavation unless determined by the Owner's Geotechnical Testing Firm to meet the definition of Mass Rock.

Unsuitable Soil Excavation: Removal and disposal of soil materials or other debris encountered at or below plan subgrade elevations, which are deemed unsuitable to remain in place by the owner's Geotechnical Testing Firm or design authority.

- a. Soil and/or other debris encountered above plan subgrade shall be considered general excavation.

- b. Soil material which, in the opinion of the Owner's Geotechnical Testing Firm, can be repaired by scarifying, drying or moistening, and recompacting, or material which is made unsuitable by delay of work, lack of protection, inclement weather, or other actions of the Contractor or their Sub-Contractors shall not be considered as unsuitable soil and shall be repaired or replaced by the contractor at no additional cost to the Owner.
- c. Any material moved or removed without the prior classification, measurement and approval by the Owner's Geotechnical Testing Firm or design authority will be considered as general excavation.

Mass Rock Excavation: Removal of a rock formation within an open excavation that (1) is a boulder larger than 1.5 cubic yards in one piece, or (2) cannot be excavated without systematic drilling and blasting. In the event Mass Rock (as defined above) is encountered, the Contractor shall demonstrate (at no additional cost to the owner) to the Owner's Geotechnical Testing Firm that the rock cannot be ripped with equipment equivalent to the following size and performance ratings, without systematic drilling and blasting.

- a. Mass Rock Excavation Equipment: Late-model, track-type tractor rated at not less than 270 hp flywheel power with a draw bar pull of 65,000 lbs at 1 mph in the lowest available gear, and the highest normal operating rpm pulling a sharp, single-toothed shank ripper. The equipment operator should be adequately qualified and experienced with ripping rock with this type equipment.

Trench Rock Excavation: Removal of a rock formation within a trench excavation that (1) is a boulder larger than 1.0 cubic yards in one piece, or (2) cannot be excavated by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling and blasting.

- a. Trench Rock Excavation Equipment: Late-model, track mounted hydraulic excavator equipped with a 42-inch wide (or smaller), short tip-radius bucket with rock teeth; rated at not less than 120-hp flywheel power with a pull of not less than 36,500-lb at a rate of 10 cubic yards per hour. The equipment operator should be adequately qualified and experienced with excavating rock with this type equipment.

Classified Excavation Requirements:

- a. Excavations more than 10 feet in width and pits more than 30 feet in either length or width are defined as open excavations.
- b. Contractor shall expose and clean the surface and any exposed areas of the rock material for classification and measurement (in-place) by the Owner's Geotechnical Testing Firm.
- c. Do not excavate rock or unsuitable soil until it has been classified and measured by the Owner's Geotechnical Testing Firm. Any material moved or removed without the prior classification and measurement by the Owner's Geotechnical Testing Firm will be considered as unclassified excavation.
- d. The Owner or the Owner's Geotechnical Testing Firm shall be the final judge on what is classified as Mass Rock, Trench Rock, or Unsuitable Soils.
- e. The contractor may be required to provide equipment specification data verifying that the above minimum-rated equipment will be used for demonstration purposes. The equipment shall be in good repair and proper working condition. The contractor may be required to provide verification of the equipment operator's qualifications and experience operating the noted equipment for rock removal purposes.
- f. Rippable rock, weathered rock, partially weathered rock, soft rock, or hard overburden soil, which is not classified as Mass Rock or Trench Rock according to the above definitions, shall be considered unclassified excavation.

EXCAVATION AND BACKFILL:

Roadway Excavation: Excavation for the roadways, drives, and parking areas shall conform to the lines, grades, cross sections, and dimensions indicated on the drawings and shall include the excavation of all unsuitable materials from the subgrade. Subgrade shall conform to proposed line, grade and cross-

section. This operation shall include any reshaping and wetting or drying required to obtain proper compaction. All soft or otherwise unsuitable material shall be removed and replaced with suitable material.

Proof Rolling and Undercut Excavation: When excavation has reached required subgrade elevations, provide a proof rolling of the prepared pavement subgrade with a loaded tandem axle dump truck (+25 tons) in the presence of the Owner's Geotechnical Testing Firm. The proof rolling shall be covered by the wheels of the proof rolling vehicle operating at a speed between 2 and 3 miles per hour.

Any areas that rut or pump excessively shall be allowed to dry or shall be undercut and backfilled with select material as directed by the Owner's Geotechnical Testing Firm.

After undercut and backfill operations are complete, a final proof rolling of the undercut areas will be performed in the presence of the Owner's Geotechnical Testing Firm.

Additional Excavation: When excavation has reached required invert/subgrade elevations, notify the Owner's Geotechnical Testing Firm, who will make an inspection of conditions.

Stability of Excavations: Slope sides of excavations to comply with local codes and ordinances 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.

Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross-braces, in good serviceable condition. Establish requirements for trench shoring and bracing to comply with local codes and authorities having jurisdiction.

Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.

Dewatering: Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.

Do not allow water to accumulate in excavations. Remove water to prevent softening of excavation bottoms. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.

Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade and shape stockpiles for proper drainage.

Excavation for Pavement: Cut surface directly beneath proposed pavement to comply with cross-sections, elevations and grades as shown.

CONTRACTOR IS TO CONTACT NC ONE CALL 48 HOURS PRIOR TO ANY EXCAVATION. CONTRACTOR SHOULD UNDERSTAND THAT ONCE EXISTING UTILITIES ARE LOCATED THAT SAID LOCATION IS VALID ONLY FOR TEN DAYS.

Should it be necessary to cut pavement or otherwise work within a public street, the North Carolina Department of Transportation is to be contacted prior to work, and applicable permits obtained.

TRENCH BACKFILL:

Excavation, bedding, haunching & backfilling shall conform to Section 02210 TRENCHING AND BACKFILLING FOR UTILITIES and Drawings.

Width of trenches at any point below top of pipe shall not be greater than outside diameter of pipe plus 16" for pipes measuring up to 30", and 24" for pipe measuring greater than 30", to permit satisfactory jointing and thorough tamping of bedding material under and around pipe. Care shall be taken not to over-excavate.

Bedding surface for pipe shall provide a firm foundation of uniform density throughout entire length of pipe. Carefully bed pipe in a sand or stone material foundation as specified, that has been accurately shaped and rounded to conform to lowest 1/4 of outside portion of circular pipe, or lower curved portion of pipe arch for entire length of pipe or arch. When necessary, tamp bedding firmly. Bell holes and depressions for joints shall be only of such length, depth, and width as required for properly making particular type joint.

Bed pipe located under pavement or building footprints in a sand or stone material foundation as specified and as indicated on Drawings.

Existing utility lines shall be protected from damage during excavation and backfilling, and, if damaged, shall be repaired by the Contractor at his expense. In the event that the Contractor damages any existing utility lines, he shall report thereof immediately. If it is determined that repairs shall be made by the Contractor, such repairs shall be ordered under terms of other sections of these specifications.

After bedding has been prepared and pipe installed, selected material from excavation or borrow, at a moisture content that will facilitate compaction, shall be placed along both sides of pipe in layers not exceeding 6" in compacted depth. Bring backfill up evenly on both sides of pipe for its full length. Care shall be taken to ensure thorough compaction of fill under haunches of pipe. Thoroughly compact each layer to an elevation of at least 12" above top of pipe. Backfill and compact remainder of trench by spreading and rolling, or compact by mechanical rammers or tampers in layers not exceeding 8".

After bedding has been prepared and pipe installed for locations under pavement and building footprints, backfill and compact remainder of trench with selected Type III or IV material from excavation or borrow.

In compacting or rolling or operating heavy equipment parallel with pipe, displacement of or injury to pipe shall be avoided. Any pipe damaged thereby shall be repaired or replaced, at option of Engineer, and at expense of the Contractor.

When fill or backfill is required to be compacted to any specified density factor, tests shall be executed by an approved laboratory to ascertain compliance with requirements, at the expense of the Owner through the established Testing Allowance. One test shall be made for each 50 linear feet of open trench. Cost of laboratory services shall be borne by the Contractor as a part of costs for this section of work for any repeat tests for any specific area which fails to meet requirements.

Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F (1 degree C).

GENERAL BACKFILL:

Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below.

In excavations, use satisfactory excavated or borrow material.

Under grassed areas, use satisfactory excavated or borrow material.

Under walks and pavements, use subbase material, or satisfactory excavated or borrow material, or combination of both.

Backfill excavations as promptly as work permits, but not until completion of the following: Inspection, testing, approval, and recording locations of underground utilities.

Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, or break-up sloped surfaces steeper than 1 vertical to 4 horizontals so that fill material will bond with existing surface.

When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.

Placement and Compaction: Place backfill and fill materials in layers not more than 8" in loose depth for material compacted by heavy compaction equipment, and not more than 4" in loose depth for material compacted by hand-operated tampers.

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.

Place backfill and fill materials evenly adjacent to structures, piping or conduit to required elevations. Take care to 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.

COMPACTION:

General: Control soil compaction during construction providing minimum percentage of density specified for each area classification indicated below.

Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture density relationship (cohesive soils) determined in accordance with ASTM D 698;

Structures, Building Slabs and Steps: Compact each layer of backfill or fill material at 95 % maximum density for cohesive material or 98 % for cohesionless material to within 2' of surface. From 2' deep to finish grade, compact 98% maximum density for cohesive material or 100% relative density for cohesionless materia.

Pavements: Compact each layer of backfill or fill material at 95% maximum dry density to within 6" of surface. From 6" deep to finish grade, compact to 100% maximum density in accordance with AASHTO-T99.

Lawn or Unpaved Areas: Compact top 6" of subgrade and each layer of backfill or fill material at 85% maximum density for cohesive soils and 90% relative density for cohesionless soils.

Walkways: Compact top 6" of subgrade and each layer of backfill or fill material at 90% maximum density for cohesive material or 95% relative density for cohesionless material.

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, to prevent free water appearing on surface during or subsequent to compaction operations.

Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to a satisfactory value.

GRADING:

General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated, or between such points and existing grades.

Grade areas as shown on the Drawings to prevent ponding. Finish surface free from irregular surface changes, and as follows:

Lawn or Unpaved Areas: Finish areas to receive a minimum of 3" layer topsoil to within not more than 0.10' above or below required sub-grade elevations.

Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 0.05' above or below required subgrade elevation.

Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more

Patches in driveways and roadways shall be graded to depth required to match existing pavement or to provide minimum pavement specified.

Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

PAVEMENT SUBBASE COURSE:

General: Subbase course consists of placing subbase material, in layers of specified thickness, over subgrade surface to support a pavement base course.

Grade Control: During construction, maintain lines and grades including crown and cross-slope of subbase course.

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 a 12" width of shoulder simultaneously with compacting and rolling of each layer of subbase course.

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.

When a compacted subbase course is shown to be 6" thick or less, place material in a single layer. When shown to be more than 6" thick, place material in equal layers, except no single layer more than 6" or less than 3" in thickness when compacted.

FIELD QUALITY CONTROL:

Quality Control Testing During Construction: Allow testing service to inspect and approve subgrades and fill layers before further construction work is performed.

If in opinion of Engineer, based on testing service reports and inspection, subgrade or fills which have been placed are below specified density, provide additional compaction and testing at no additional expense.

MAINTENANCE:

Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

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.

DISPOSAL OF EXCESS AND WASTE MATERIALS:

Removal from Owner's Property: Remove waste materials, including unacceptable excavated material, trash and debris, and dispose of off Owner's property.

Comply with and coordinate with the project Construction Waste Management Plan (CWMP).

END OF SECTION

RELATED DOCUMENTS:

The general provisions of the Contract, including General and Supplementary Conditions, and General Requirements, and Division 1 specifications that apply to the work specified in this Section.

PART 1 - GENERAL

- 1.1 DESCRIPTION: Perform site preparations, excavation, and backfilling of all materials encountered and to the depths required to complete the work as shown on the Drawings.
- 1.2 EXISTING CONDITIONS: Every reasonable effort has been made to provide accurate information on existing site conditions. The Contractor should become familiar with the site and satisfy himself as to the scope of work involved and the materials to be encountered. Any significant change in conditions should be immediately brought to the attention of the Owner's representative.

PART 2 - MATERIALS

2.1 SOILS

- 2.1.1 General: Use soils free of organic matter, refuse, rocks and lumps greater than 4 inches in diameter and other deleterious matter.
- 2.1.2 Classification: For the purpose of this specification, soils to be used as fill material are grouped into seven classes according to soil properties and characteristics.

Class I	Clean gravel complying with ASTM C33, coarse aggregate No. 57.
Class II	Clean sand complying with ASTM C33, fine aggregate.
Class III	Clean gravels and sands complying with ASTM D2487, Types GW, GP, SW, and SP.
Class IV	Soil mixtures complying with ASTM D2487, Types GM, GC, SM, & SC.
Class V	Soil mixtures complying with ASTM D2487, Types ML and CL.
Class VI	Soil mixtures complying with ASTM D2487, Types MH and CL.
Class VII	Organic soil mixtures complying with ASTM D2487, Types OL, OH & PT.

PART 3 – EXECUTION

3.1 GENERAL

- 3.1.1 Familiarization: Prior to commencement of the earthwork, become thoroughly familiar with the site, the site conditions, and all portions of the work specified in this Section.
- 3.1.2 Approvals: Backfilling and grading operations shall not commence until all required inspections, tests and approvals have been completed. Work covered prior to inspection shall be uncovered for inspection purposes and backfilled at no additional cost to the Owner.

SURFACE PREPARATION

- 3.1.1 Clearing: Areas designated for clearing and required for construction operations shall be cleared of trees, brush, structures and other materials. Trees that are to remain shall be protected during clearing operations and subsequent work.
- 3.1.2 Grubbing: Roots, stumps and other materials shall be grubbed from the cleared areas to a depth of at least 18 inches. Tree stumps shall be grubbed in their entirety, including taproots where applicable.
- 3.1.3 Topsoil: Strip existing topsoil to a depth of 4 inches from areas to be excavated or graded. Stockpile the topsoil in a suitable area for use during final grading operations. Protect the topsoil from erosion.
- 3.1.4 Unsuitable Material: Remove sod, muck or other unsuitable material to firm subsoil in areas designated for filling or grading operations.
- 3.1.5 Disposal: Trees, stumps, roots, rubbish, unsuitable soil or other material resulting from surface preparation shall be removed from the site by the Contractor and disposed of.

3.2 EXCESS WATER CONTROL:

- 3.2.1 General: Grade and maintain all areas of the site to preclude surface runoff into excavations and prevent ponding of water.
- 3.2.2 Dewatering: Excavations shall be kept free of surface water and/or groundwater. Provide and maintain at all times the necessary means and devices to prevent water from entering the excavations and for removing all water entering the excavations.

3.3 TRENCHING, BACKFILLING AND COMPACTION FOR UTILITY SYSTEMS

- 3.3.1 General: Refer to specific utility sections in these Specifications for installation requirements. Trench, backfill, and compact as specified except as modified herein.
- 3.3.2 Trenching: Trench widths at and below the top of the pipe shall be the minimum necessary for proper installation. Trench banks above the top of the pipe shall be as vertical as practicable. Over-depth excavation shall be backfilled with suitable bedding material and compacted. The Contractor shall provide, at his expense and as directed by the Owner's representative, special bedding material or concrete encasement as may be necessary due to over excavation.
- 3.3.3 Depth: Trench to the lines and grades shown on the drawings. Where elevations are not shown, trench to depth sufficient to provide at least 36 inches of cover above the top of pipe, unless otherwise specified. Grade trenches to provide a constant slope free of sags and high spots.
- 3.3.4 Trench Bracing: Properly brace, sheet and support trench walls in strict conformance with all pertinent laws and regulations. Provide adequate bracing and shoring to protect adjacent improvements.
- 3.3.5 Bedding, Haunching, and Initial Backfill: Tamp subgrade to provide firm, even bedding. Excavate bedding material to match the shape of the bottom of the pipe and bell, as detailed in the Drawings. Place haunching material so as to provide full bearing around the bottom of the pipe. Haunching and initial backfill shall be Class I, II, III, or IV placed in 12 inch maximum lifts to a level 12 inches above the top of pipe and compacted to a minimum 95 percent Standard Proctor by the AASHTO - T99 method.
- 3.3.6 Backfill: Backfill the remainder of the trench in accordance with the paragraphs below:

- 3.3.6.1 Pavement Areas: Compact the subgrade and fill material beneath paved areas and shoulders to a minimum 95 percent Standard Proctor by the AASHTO-T99 method. Compact top 6" of subgrade to 100 percent Standard Proctor by the AASHTO-T99 method.
- 3.3.6.2 Landscaped Areas: Compact the subgrade and fill to a minimum 90 percent standard proctor by the AASHTO-T99 method.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

DESCRIPTION OF WORK:

Provide soil treatment for termite control, as herein specified.

QUALITY ASSURANCE:

In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work, including preparation of substrate and application.

Engage a professional pest control operator, licensed in accordance with regulations of governing authorities for application of soil treatment solution.

JOB CONDITIONS:

Restrictions: Do not apply soil treatment solution until excavating, filling and grading operations are completed, except as otherwise required in construction operations.

To insure 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.

SUBMITTALS:

Product Data: Submit manufacturer's technical data and application instructions.

SPECIFIC PRODUCT WARRANTY:

Furnish written warranty certifying that applied soil poisoning treatment will prevent infestation of subterranean termites and, that if subterranean termite activity is discovered during warranty period, Contractor will re-treat soil and repair or replace damage caused by termite infestation.

Provide warranty for a period of 5 years from date of treatment, signed by Applicator and Contractor.

PART 2: PRODUCTS

SOIL TREATMENT SOLUTION:

The pest control operator will submit the Safety Data Sheet and label of the termiticide he will use on the project. The termiticide must be currently approved as a termiticide by the N. C. Structural Pest Control Committee.

PART 3: EXECUTION

APPLICATION:

Surface Preparation: Remove foreign matter which could decrease effectiveness of treatment 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 placement of compacted fill under slabs, if recommended by toxicant manufacturer.

All treatments (excluding the rate of application and treating techniques) must be performed as outlined on the termiticide's label.

All treatments in regards to rate of application and treatment technique will be performed as outlined in the N. C. Structural Pest Control Committee's Rules and Regulations as currently applies to treatment of commercial buildings under construction.

All treatments performed pursuant to Rule. -506 shall be performed at the label recommended rate and concentration only.

Minimum Treatment Requirements:

1. Establish a vertical barrier in the soil along inside of the main foundation wall; the entire perimeter of all multiple masonry chimney bases, pillars, pilasters, and piers; and both sides of partition or inner walls with a termiticide from the top of the grade to the top of the footing.
2. After a building or structure has been completed and the excavation filled and leveled, so that the final grade has been reached along the outside of the main foundation wall, establish a vertical barrier in the soil adjacent to the outside of the main foundation wall with a termiticide from the top of the grade to the top of the footing, according to the label; except that, where drain tile, trench drains or other foundation drainage systems present a hazard of contamination outside the treatment zone, treatment shall be performed in a manner that will not introduce termiticide into the drainage system.
3. Establish a horizontal barrier in the soil within 3' of the main foundation, under slabs, such as patios, walkways, driveways, terraces, gutters, etc. Treatment shall be performed before slab is poured, but after fill material or fill dirt has been spread.
4. Establish a vertical barrier in the soil around all critical areas, such as expansion and construction joints and plumbing and utility conduits, at their point of penetration of the slab of floor or, for crawl space construction, at the point of contact with the soil.

Reapply soil treatment solution to areas distributed by subsequent excavation or other construction activities following application.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1:

DESCRIPTION OF WORK:

The work required is that necessary to conduct the construction in accordance with the requirements the North Carolina Sedimentation Pollution Control Act of 1973 and the rules and regulations promulgated pursuant to the provisions of said act.

Related Work Specified Elsewhere:

Fertilizing, Seeding and Mulching: Section 02480

Codes and Standards: North Carolina Sedimentation Pollution Control Act of 1973 and the Rules and Regulations promulgated pursuant to the provisions of said act.

Local County Soil Erosion and Sedimentation Control Ordinance.

In the event of conflict between the regulations listed above and the requirements of these specifications, the more restrictive requirements shall apply.

PART 2: PRODUCTS

PART 3: EXECUTION

GENERAL:

Construct temporary and permanent erosion control measures as shown on the plans and as directed by the Engineer. All permanent erosion control work shall be incorporated into the project at the earliest practicable time. Temporary erosion control measures shall be coordinated with permanent erosion control measures and all other work on the project to assure economical, effective, and continuous erosion control throughout the construction and post construction period and to minimize siltation of rivers, streams, lakes, reservoirs, other water impoundments, ground surfaces, or other property.

The Contractor shall finish grade all disturbed areas and disc the ground surface upon completion of the grading.

The finish grading shall be acceptable to the Owner.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

DESCRIPTION OF WORK:

Extent of portland cement concrete paving includes concrete sidewalks, curbs and gutters, as shown on Drawings.

Prepared subbase is specified in Section 02200.

Concrete and related materials are specified in Section 03200.

QUALITY ASSURANCE:

Codes and Standards: Comply with NCDOT Regulations if more stringent than herein specified.

SUBMITTALS:

Furnish samples, manufacturer's product data, test reports, and materials' certifications as required in referenced sections for concrete and joint fillers and sealers.

Install sample section of concrete sidewalk for review and approval by Architect. Mockup sample to include full construction features required by Drawings, including expansion joints and sealants, and control joints.

JOB CONDITIONS:

Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

Utilize flagmen, barricades, warning signs and warning lights as required.

PART 2: PRODUCTS

MATERIALS:

Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.

Use flexible spring steel forms or laminated boards to form radius bends as required.

Coat forms with a non-staining form release agent that will not discolor or deface surface of concrete.

Concrete Materials: Comply with requirements of applicable Division - 3 Sections for concrete materials, admixtures, bonding materials, curing materials, and others as required.

Welded Steel Wire Fabric: ASTM A185 Plain Type; in flat sheets; unfinished. Rolled WWF shall not be acceptable for use on this job.

Expansion Joint Materials: Bituminous Fiber, 1/2" thick, complying with NCDOT Spec. Section 928-1 and Section 420-12.

Liquid-Membrane Forming Curing Compound: Complying with ASTM C 309, Type I, Class A unless other type acceptable to Engineer. Moisture loss not more than 0.055 gr. / sq. cm. when applied at 200 sq. ft. / gal.

Detectable Tactile Warning Surfaces: Vitrified polymer composite panels, cast into concrete. Dark color. "Armor-Tile" as manufactured by Engineered Plastics or equivalent. Comply with all ADA and NC Accessibility code requirements.

CONCRETE MIX, DESIGN AND TESTING:

Comply with requirements of applicable Division - 3 Sections for concrete mix design, sampling and testing, and quality control, and as herein specified.

Design mix to produce normal-weight concrete consisting of portland cement, aggregate, water-reducing or high-range water-reducing admixture (super - plasticizer), air-entraining admixture and water to produce the following properties:

Compressive Strength: 3,000 psi, minimum at 28 days, unless otherwise indicated.

Slump Range: Not greater than 4".

Air Content: 5 % - 8%.

PART 3: EXECUTION

SUBSURFACE PREPARATION:

Remove loose material from compacted subbase surface immediately before placing aggregate base course. No aggregate base course shall be placed until the foundation has been inspected and approved by the Engineer. Proof-rolling may be required depending on condition of subbase.

Place aggregate base course material on prepared subgrade in layers of uniform thickness. Grade the base course evenly to thickness indicated on drawings and compact before placing concrete.

FORM CONSTRUCTION:

Set forms to required grades and lines, rigidly braced and secured. Install sufficient quantity of forms to allow continuous progress of work and so that forms can remain in place at least 2 hours after concrete placement.

Check completed formwork for grade and alignment to following tolerances:

Top of forms not more than 1 / 8" in 10'.

Vertical face on longitudinal axis, not more than 1/4" in 10'.

Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage.

REINFORCING

Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions, including load bearing pads.

CONCRETE PLACEMENT:

General: Comply with requirements of Division - 3 Sections for mixing and placing concrete, and as herein specified.

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.

Place concrete using methods which 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 discoloration of reinforcing, dowels, and joint devices.

Deposit and spread concrete in a continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2-hour, place a construction joint.

Drop top of curb as shown in details of plans at all radii of intersections, to allow construction of handicapped ramps and sidewalks.

Curbs and Gutters: Automatic machine may be used for curb and gutter placement at Contractor's option. If machine placement is to be used, submit revised mix design and laboratory test results which meet or exceed minimums specified. Machine placement must produce curbs and gutters to required cross-section, lines, grades finish, and jointing as specified.

JOINTS:

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.

When joining existing structures, place transverse joints to align with previously placed joints, unless otherwise indicated.

Exterior Concreted Walks: Provide all concrete walk surfaces with a concrete walk 1/2" tooled expansion joints at 30' centers maximum and sawcut weakened-plane (contraction) joints at 5' centers maximum. Pour sample for Architect approval.

Weakened-Plane (Contraction) Joints: Provide sawcut weakened-plane (contraction) joints, sectioning concrete sidewalks at 5' intervals. Sawcut weakened-plane joints for a depth equal to at least 1/4 concrete thickness, as follows:

Sawcut joints at concrete walks as soon as concrete has sufficient strength to prevent spalling of the joint due to the action of the saw. But in no case greater than 4 hours after initial placement of the concrete. Concrete walk sawcut joints shall not be filled with joint filler.

Tooled Joints: Form tooled joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer. Remove tooling marks.

Construction Joints: Place tooled construction joints at end of placements and at locations where placement operations are stopped for a period of more than 1/2-hour, except where such placements terminate at expansion joints.

Construct joints as shown or, if not shown, use standard metal keyway-section forms.

Locate expansion joints at 90' o.c. for each curb and gutter section and 30' o.c. for each sidewalk section unless otherwise indicated, and at beginning and end of all curb and gutter radii. Connections with rigid objects including existing curb and gutter and catch basins.

Extend joint fillers full-width and depth of joint, and not less than 1/2" or more than 1" below finished surface where joint sealer is indicated. If no joint sealer, place top of joint filler flush with finished concrete surface.

Furnish joint fillers in one-piece lengths for full width being placed, wherever possible. Where more than one length is required, lace or slip joint filler sections together.

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.

Fillers and Sealants: Comply with manufacturer's requirements for preparation of joints, materials installation, and performance. Place at all curb and gutter template joints, curb-to-walk transition joints, concrete walk expansion joints, tooled concrete walk construction joints. Joint filler not required at 5' O.C. sawcut weakened-plane contraction joints.

CONCRETE FINISHING:

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.

After floating, test surface for trueness with a 10' straight edge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous smooth finish.

Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round to 1/2" radius, unless otherwise indicated. Eliminate tool marks on concrete surface.

After completion of floating and troweling when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:

Provide all concrete walk surfaces with a unidirectional fine broom finish. Pour sample for Architect approval.

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 Engineer.

Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honey combed areas. Remove and replace areas or sections with major defects, as directed by Engineer.

CURING:

Protect and cure finished concrete paving, complying with applicable requirements of Division - 3 Sections. Use membrane-forming curing and sealing compound or approved moist-curing methods.

REPAIRS AND PROTECTIONS:

Repair or replace broken or defective concrete, as directed by Engineer.

Drill test cores where directed by Engineer, 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.

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.

Sweep concrete and wash free of stains, discolorations, dirt and other foreign material just prior to final inspection.

END OF SECTION

RELATED DOCUMENTS

The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this section.

PART 1 - GENERAL

RELATED WORK SPECIFIED ELSEWHERE:

Section 02200 Earthwork

DESCRIPTION OF WORK:

The extent of storm sewer collection system work and materials required are shown on drawings.

Storm Sewer collection system may include, in complete assemblies, but is not limited to, all of the following:

- Storm sewer pipe, RCP and PVC.
- PVC Plastic Structures for Underground Drainage Piping System.
- Trench Drains
- Rip Rap.
- Catch basins / Manholes

QUALITY ASSURANCE:

CODE AND STANDARDS: Comply with applicable requirements of NCDOT.

SUBMITTALS:

Shop Drawings, Storm Sewer System: Submit shop drawings for the system, including details of underground structures, metal accessories, fittings, and connections, and any variations from those details shown on the drawings.

MATERIAL CERTIFICATES: Provide material certificates signed by the material manufacturer and Contractor for all pipe manhole, catch basins, frames and grates indicating each complies with specifications.

PART 2 - PRODUCTS

CONDUIT MATERIALS:

Polyvinyl Chloride (PVC) Pipe: PVC pipe shall conform to the requirements of ASTM D3034 (SDR35). Joints and fabricated fittings shall be glued hub joints and shall be assembled in accordance with the pipe manufacturer's recommendations and Specification D3212. Minimum cell class shall be 12454B. PVC pipe shall be supplied in 13.0 foot lengths.

Reinforced Concreted Pipe (RCP):

RCP shall be of tongue and groove construction in accordance with ASTM C-76, Class III. All pipe shall be stamped by supplier - "R. C.". Joint material shall be ConSeal CS-102 Butyl Rubber Sealant gasket, or ConSeal CS-202 Butyl Rubber Sealant gasket conforming to ASTM C 990, and Federal Specification SS-S-210.

TRENCH DRAINS:

Provide vehicle traffic grade Trench Drains where indicated. Provide polymer concrete products equal to ACO Drain K100S complete with heavy duty ductile iron gratings locked down with quick locking bolt and bar type lockings as manufactured by ACO Polymer Products.

Provide general purpose grade Trench Drains designed for use in concrete slab applications where indicated. Provide fiberglass channel products equal to ACO Drain FG100 complete with Load Class B, ADA rated, perforated galvanized steel gratings, locked down with quick locking bolt and bar type lockings as manufactured by ACO Polymer Products.

PVC DRAIN BASINS and INLINE DRAINS:

Provide vehicle traffic grade Drain Basins and Inline Drains where indicated shall be PVC with heavy duty ductile iron grates. Products equal to Nyloplast by Advanced Drainage Systems.

CONCRETE MANHOLES:

General: Manholes and Catchbasins shall be precast concrete where indicated. Manholes not of a conventional size may be of concrete block or brick.

Precast Concrete Manholes: Shall comply with ASTM C-478, sized as indicated, with an eccentric cone, precast top, precast bottom and O-Ring joint conforming to ASTM C 493, or RAM-NEK Preformed Plastic Gasket.

Interior diameter of precast manholes shall be based upon pipe size as follows unless otherwise indicated:

<u>Pipe Size</u>	<u>Interior Diameter</u>
Less than 24"	4'
24" - 30"	5'
Larger than 30"	6'

MASONRY MATERIALS:

Concrete Masonry Units (Manhole Block): ASTM C 139.

Manhole Drop Inlet and Catch Basin Brick: ASTM C 32, Grade MS.

Concrete Brick: ASTM C 55, Grade NI.

Masonry Mortar: ASTM C 270, Type M, approximately 1:1 / 4:2 Portland Cement, lime, sand.

Concrete Block: ASTM C 90, Grade NI.

For minor amounts of mortar, packaged materials complying with ASTM C 387, Type M, will be acceptable.

Plasticizing Agent: Omicron or equal. Use in accordance with manufacturer's instructions.

ACCESSORIES:

General: All metal accessories for manholes, catch basins and drop inlets shall be gray cast iron, ASTM A 48, Class 30B. Frames, grates and covers shall be factory coated with an asphalt base paint. Install metal accessories as shown on the drawings.

Rip Rap: Rip rap shall be accomplished in accordance with Section 868 of the N. C. State Highway Specifications for Roads and Structures. Rip rap shall be located and be of the class shown on plans.

Filter Cloth: Filter cloth shall be composed of strong rot proof synthetic fibers formed into a fabric shall be free of any treatment or coating which might significantly alter its physical properties after installation. The filter cloth shall have a puncture strength to withstand a minimum force of 100 lbs., in accordance with ASTM D 751. Filter cloth as manufactured by Monsanto, Carthage Mills, Inc., or approved equal will be acceptable.

Downspout Transition Boots: Downspout transition boot fitting for each downspout shall be a PVC Sewer Solvent Weld Downspout Adaptor, sized for 4'x4" downspout transition to the underground leader pipe size indicated. Provide an SDR 35 fitting, meeting ASTM D-2729, and ASTM D-3034 requirements, utilizing solvent welded connection to SDR 35 PVC pipe leaders. As manufactured or distributed by Ferguson, Grainger, Genova, NDS or equivalent.

PART 3 - EXECUTION

INSPECTION:

Contractor must examine the areas and conditions under which storm sewer system work is to be installed. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Engineer.

INSTALLATION OF CONDUIT (PIPE):

General:

Perform excavation, trenching, bedding, haunching and backfilling as specified in appropriate Division 2 Sections. Conduct backfill operations of open-cut trenches closely following laying, jointing and bedding of pipe, and after initial inspection and testing are completed.

Pipe bedding, haunching and backfilling shall be in accordance with requirements set forth in Section 02210, TRENCHING AND BACKFILLING FOR UTILITIES.

Inspect conduit before installation to detect any apparent defects. Mark defective materials with white paint and promptly remove from the site.

Particular care shall be taken to prevent damage to pipe and fitting linings and coatings. Pipe shall be protected during handling against impact shocks and free fall.

Lay conduit beginning at the low point of a system, true to the grades and alignment indicated with unbroken continuity of invert. The line and invert grade of each pipe shall be checked from top line carried on batter boards not over 24' apart or by a laser and target.

Cross above or below other pipe a minimum of 6" unless otherwise directed by the Engineer.

Place bell ends of conduit or the groove end of concrete facing upstream.

Bell holes shall be excavated for each joint to assure bedding supports the barrel of the pipe and to facilitate making a perfect joint. Preparatory to making pipe joints, all surfaces of the portion of the pipe to be jointed or of the factory-made jointing materials shall be clean and dry.

Install gaskets in accordance with manufacturer's recommendations for the use of lubricants, cements, and other special installation requirements.

The Contract Documents shall provide for the construction of a Foundation of No. 57 crushed stone in the bottom of trenches when unstable material is encountered. Such unstable material shall be removed to the depth required by the Architect's testing representative and replaced with No.57 stone such that the pipe will be adequately supported throughout the entire length. Excavation below the planned pipe invert elevation as shown on the Approved Plans shall be refilled with No. 57 crushed stone.

Reinforced Concrete Pipe (RCP): Install in accordance with applicable provisions of the American Concrete Pipe Association "Concrete Pipe Field Manual", unless otherwise indicated.

PVC PIPE INSTALLATION:

Flexible thermoplastic sewer pipe shall be installed in accordance with ASTM D2321- 83a, except as modified by these specifications and the specific recommendations of the pipe manufacturer.

Pipe cutting, where permitted, shall be done in accordance with the written recommendations of the pipe manufacturer. Only factory cut ends shall be used for solvent weld joints.

Trenches shall be excavated in straight lines and uniformly sloped between manholes or junction structures. The trench shall be excavated a minimum of six inches (6") below the pipe bottom in order to receive the required bedding of Class I No. 57 crushed stone. Pipe bedding, haunching and backfilling shall be in accordance with requirements set forth in Section 02210, TRENCHING AND BACKFILLING FOR UTILITIES.

Cleaning Conduit: Clear the interior of conduit of dirt and other superfluous material as the work progresses.

Place plugs in the ends of uncompleted conduit at the end of the day or whenever work stops.

Flush lines between manholes as required to remove collected debris.

Interior Inspection: Inspect conduit to determine whether line displacement or other damage has occurred.

A light held in a manhole shall show a full circle of light when viewed from the adjoining end of the line.

Make inspections after lines between manholes, or manhole locations, have been installed and approximately two feet of backfill is in place and at completion of the project.

If the inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects, take whatever steps are necessary to correct such defects to the satisfaction of the Engineer.

Connection to Existing Structures: Pipe connections to existing structures shall be made in such manner that the finished work will conform as nearly as practicable to the essential applicable requirements specified for new structures, including all necessary concrete work, cutting, and shaping.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

1.1 SECTION INCLUDES

- A. Formwork for cast—in place concrete, with shoring, bracing and anchorage.
- B. Formwork for depressed floor slabs substrates for terrazzo finish.
- C. Openings for other work.
- D. Form accessories.
- E. Form stripping.

1.2 RELATED SECTIONS

- A. Section 03200 — Concrete Reinforcement.
- B. Section 03300 — Cast-in-Place Concrete.
- C. Section 09400 - Terrazzo

1.3 REFERENCES

- A. ACI 301 — Structural Concrete for Buildings.
- B. ACI 318 — Building Code Requirements for Reinforced Concrete.
- C. PS 1 — Construction and Industrial Plywood.

1.4 DESIGN REQUIREMENTS

- A. Design and construct formwork, shoring and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line and dimension.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301 and 318.
- B. Maintain one copy of each document on site.

1.6 REGULATORY REQUIREMENTS

- A. Conform to ACI 301 and ACI 318 code for design, fabrication, erection and removal of formwork.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site to prevent damage.
- B. Store off ground in ventilated and protected manner to prevent deterioration from moisture.

1.8 COORDINATION

- A. Coordinate this Section with other Sections of work which require attachment of components to formwork.
- B. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Architect/Engineer.

PART 2: PRODUCTS

2.1 WOOD FORM MATERIALS

- A. Plywood: Douglas Fir; solid one side, tight faced undamaged sheets with clean, true edges.

2.2 MANUFACTURERS — PREFABRICATED FORMS

- A. Symons or equal.

2.3 PREFABRICATED FORMS

- A. Preformed Steel Forms: Minimum 16 gage, matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
- B. Steel Tubular Column Type: Round, steel material, minimum 16 gage, surface treated with release agent, of sizes required.

2.4 FORMWORK ACCESSORIES

- A. Form Ties: Snap—off type, galvanized metal, cone type, with waterproofing washer.
- B. Form Release Agent: Colorless mineral oil which will not stain concrete, or absorb moisture.
- C. Dovetail Anchor Slot: Galvanized steel, 22 gage, foam filled.
- D. Flashing Reglets: Galvanized steel, 22 gage, longest possible lengths, with alignment splines for joints, foam filled,
- E. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.
- F. Waterstops: Hydrophillic type as manufactured by American Colloid or approved equal.

PART 3: EXECUTION

3.1 EXAMINATION

- A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.2 EARTH FORMS

- A. Hand trim sides and bottom of earth forms. Remove loose soil, mud, and debris prior to placing concrete.

3.3 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 over stressing by construction loads.
- C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- D. Align joints and make watertight. Keep form joints to a minimum.
- E. Obtain approval before framing openings in structural members which are not indicated on Drawings.
- F. Provide chamfer strips on exposed external corners.

3.4 APPLICATION — FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings which are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.5 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 which 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. Including concrete substrate depressions for terrazzo floor finish.
- D. Position recessed reglets for brick veneer masonry anchors to spacing and intervals noted on drawings or specified in Section 04200.
- E. Install accessories in accordance with manufacturer's instructions, straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- F. Install waterstops in accordance with manufacturer's instruction continuous without displacing reinforcement.
- G. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- H. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.6 FORM CLEANING

- A. Clean forms as erection proceeds, to remove foreign matter within forms.

- B. Clean formed cavities of debris prior to placing concrete.
- C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean—out ports.
- D. During cold weather, remove ice and snow from within forms. Do not use de—icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.7 FORMWORK TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 301.

3.8 FIELD QUALITY CONTROL

- A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.

3.9 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

DESCRIPTION OF WORK:

Work of this Section shall include furnishing all labor and materials required to provide all cast-in-place concrete scheduled on Drawings and as specified in this Section.

Related Work Specified Elsewhere:

Concrete Formwork (Section 03100)
Concrete Reinforcement (Section 03200)
Polished Concrete Floor Finishes (Section 03362)
Terrazzo (Section 09400)

INDUSTRY STANDARDS:

For listing of names of industry standard agencies mentioned by abbreviation in this section refer to Industry Standards Index in Division 1.

LEED NC, U. S. Green Building Council

DELIVERY AND PROTECTION OF MATERIALS:

Store cement in weather tight structure with floor at least 12 inches off ground, and accessible for inspection in original packages.

Store fine and coarse aggregate separately. Segregate sizes and avoid getting dirt and foreign materials in concrete.

Deliver ready-mixed concrete in compliance with requirements set forth in ASTM C 94.

Provide documentation of LEED credits requirements for use of local regional materials.

SEVERE-WEATHER PROVISIONS:

Cold-Weather Concreting: (In accordance with ACI 306 and as follows):

Provide adequate equipment for heating concrete materials and protecting concrete during freezing or near-freezing weather. Do not use frozen materials, or materials containing ice.

All concrete materials and all reinforcement, forms, fillers, and around which concrete is in contact shall be free from frost.

Whenever temperature of surrounding air is below 40 degrees F., all concrete shall have temperature between 70 degrees and 80 degrees F. Provide adequate means for maintaining temperature not less than 70 degrees F. for three days, or 50 degrees F. for five days, or for as much more time as is necessary to insure curing of concrete.

Use no salt or other chemicals to prevent freezing.

Housing, covering, or other protection used in connection with curing shall remain in place, intact, at least 24 hours after artificial heat is discontinued.

Hot Weather Concreting: (In accordance with ACI 305 and as follows):

Provide adequate methods of lowering temperature of concrete ingredients so that temperature of concrete when placed does not exceed 90 degrees F.

When weather is such as to raise concrete temperature, as placed, consistently above 80 degrees F., use approved retarder.

Sprinkle all subgrade and forms with water before placing concrete. Remove all excess water before placing concrete.

Start curing as soon as practicable to prevent evaporation of water and keep forms wet. Protect flat work from dry wind, direct sun, and high temperatures.

PART 2: PRODUCTS

CEMENT:

Cement shall be standard portland cement of United States manufacture, conforming to ASTM C 150, Type I or Type III. Only one brand of commercial portland cement shall be used. Each bag shall weigh approximately 94 pounds and contain one cubic foot.

CONCRETE AGGREGATES:

Fine Aggregate: Washed sand having clean, hard, durable, uncoated grains, free from harmful substances conforming to ASTM C 33.

Coarse Aggregate for standard-weight concrete: crushed stone, gravel, or other approved inert material having clean, hard, durable uncoated particles conforming to ASTM C 33. Maximum size, in accordance with ACI 318.

Lightweight Coarse Aggregate shall conform to ASTM C 330. Lightweight aggregate shall be expanded shale or slate. Maximum size of aggregate shall be of 3/4".

WATER:

Clean and free from harmful amounts of acids, alkalies, or organic materials.

VAPOR BARRIER:

Vapor barrier under floor slabs on earth shall be puncture resistant polyethylene sheet not less than 15 mils thick, with permeance of less than 0.01 perms per ASTM F 1249 or ASTM E 96, and in compliance with ASTM E 1745 Class A and ACI 302. Accessories would include seam tape and vapor proofing mastic with permeance less than 0.03 perms. Provide pipe boots constructed from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.

EXPANSION JOINT MATERIALS:

Expansion joint material shall be asphalt-impregnated fiber strips, 1/2" thick, unless otherwise shown or noted: Flexcell by Celotex Corporation, Sealtight by W. R. Meadows, Inc., Joint Filler by Serviced Products Corporation, or approved equal.

ADMIXTURES:

Water Reducing Admixture: ASTM C 494, Type A, and contain no chloride ions.

Air Entraining Admixture: ASTM C 60 for slabs permanently exposed to weather. No air entraining admixture is to be used for concrete not exposed to weather. Air content is to be confirmed by lab tests for both air entrained and non-air entrained mixes.

CLASS OF CONCRETE:

f'c minimum 3000 psi, maximum 150 pcf (regular weight).

f'c minimum 3000 psi, maximum 110 pcf (light weight-for use in elevated slabs).

f'c minimum 3000 psi, maximum 150 pcf (regular weight pea gravel) high slump mix for concrete masonry fill.

MIX DESIGNS:

Contractor shall select a testing laboratory acceptable to Architect to verify mixes of all classes of concrete.

Contractor shall submit samples in adequate quantities for each mix verification, of all concrete materials to be used on project to designated testing laboratory.

Laboratory shall be engaged by and paid by the contractor out of the material testing allowance.

Submit four (4) copies of all mix design, aggregate test results, and compression test results to Architect prior to use on the job.

PLANT MIXING:

Proportioning Concrete:

Stresses for design of this structure are based on specified minimum 28-day compressive strength of concrete. Proportions shall be in compliance with approved design mix for each class of concrete.

Batching:

Ready-mixed concrete shall be mixed and delivered in accordance with requirements of ASTM C 94.

Coordinate with requirements of Section 03362 – Polished Concrete Floor Finishes.

Coordinate with concrete curing and depressed substrate requirements of Section 09400 – Terrazzo.

Producer shall furnish delivery ticket with each load of concrete delivered under this Specification. Delivery ticket shall show clearly class and strength of concrete, size of coarse aggregate, slump ordered, and date and time of departure from batching plant.

1. Stresses for design of this structure are based on specified minimum 28-day compressive strength of concrete. Proportions shall be in compliance with approved design mix for each class of concrete.

2. Regular weight 3000 psi concrete shall be proportioned for a slump of 4" + or - 1".
3. Lightweight 3000 psi concrete shall be proportioned for a slump of 6" + or - 1".
4. Fine aggregate 3000 psi concrete masonry grout shall be proportioned for a slump of 8" + or - 1".
5. All concrete shall be proportioned for a maximum water to cement ratio 0.5.
6. Concrete not permanently exposed to weather such as concrete for foundations, interior slabs on grade, concrete unit masonry grout, and elevated slabs on composite metal deck shall not have air added by entrainment admixtures. This requirement shall be verified by the testing laboratory.
7. Concrete to be permanently exposed to weather shall have air added by entrainment admixtures. Air content shall be 5% + or - 1%. This requirement shall be verified by the testing laboratory.

CONVEYING EQUIPMENT:

Carts or buggies transporting concrete more than 50 feet shall be equipped with pneumatic tires.

Equipment for chuting or conveying concrete shall be of sufficient size to insure continuous flow of concrete at delivery and without separation of materials.

PART 3: EXECUTION

EVALUATION OF COMPRESSION TESTS:

Evaluation of results of tests for ultimate-strength design concrete shall be according to ACI 318.

Neither results of laboratory verification tests nor any provision in Contract Documents shall relieve Contractor of obligation to furnish concrete of class and strength specified.

INSPECTION OF WORK BEFORE PLACING:

Inspect work to receive concrete for deficiencies which would prevent proper execution of finished work. Do not proceed with placing until such deficiencies are corrected.

Do not place concrete on earth until fill or excavation has been prepared as set forth under applicable sections of specifications for that work as verified by the testing lab.

Before any concrete is placed in form, all pipes or sleeves, openings, or embedded items shall be in place and shall receive all tests specified for them.

Remove all grease, oil, mud or other foreign matter from forms and have reinforcing steel in proper condition and position before placement of concrete. Dowels shall be in place and tied off prior to placing concrete.

Remove hardened, or partially hardened, concrete on forms or reinforcement before placing concrete.

CONVEYING:

Convey concrete from mixer to placement by methods which will prevent separation or loss of material. No water shall be added at the site to aid placement of concrete. Concrete too stiff to be properly placed shall be rejected and removed from the site and legally disposed of at no additional cost to the owner.

Runway supports shall not bear upon reinforcing steel or fresh concrete.

If pump(s) are used for conveying concrete, there shall be no aluminum in contact with the concrete, either in pump or in conveying pipes.

Clean conveying equipment thoroughly before run of concrete at frequent intervals.

CONSTRUCTION AND EXPANSION JOINTS:

Construction Joints: Early in construction program, contractor shall review with Architect construction joints he proposes to use, not indicated on the Drawings. Contractor shall not use any construction joints not approved by Architect.

Expansion Joints: Install as indicated.

PLACING:

Deposit concrete as nearly as practicable in its final position to avoid rehandling. Do not deposit concrete on work partially hardened or contaminated by foreign material. Do not use retempered concrete. In no case use concrete when elapsed time, after addition of water and cement to batch, exceeds one hour.

Concrete shall not be dropped more than four feet. For dropping greater distances use metal chutes or tremie pipes.

Once concreting is started carry on as continuous operation until placing of section is completed. Finish top surface to true plane. When construction joints are necessary, they shall be made in accordance with article above. Do not allow cold joints to occur within pours.

Compact all concrete thoroughly by suitable means during placing, and work thoroughly around reinforcement, embedded fixtures, and into corners of forms. When vibrator is used, apply directly to concrete. Do not over vibrate.

PROTECTION

During curing period protect concrete from damaging mechanical disturbances, particularly load stresses, heavy stock, and excessive vibration. Protect all finished concrete surfaces from damage by construction equipment, materials, or methods, and by rain, running water, hot sun, or windy conditions. Do not load self supporting structures in such a way as to overstress concrete.

Coordinate with protection requirements of Section 03362 – Polished Concrete Floor Finishes.

Coordinate with protection requirements of Section 09400 – Terrazzo.

TESTING:

Conduct strength tests of concrete in accordance with following procedures:

Secure composite samples in accordance with "Method of Sampling Fresh Concrete" (ASTM C 172).

Mold and cure five specimens from each sample in accordance with "Method of Making and Curing Concrete Compression and Flexure Specimens in the Field" (ASTM C 31). Five specimen comprise one test.

Test Two Specimens at 7 days (ASTM C 39). Test two specimens at 28 days in accordance with "Method of Test for Compressive Strength of Molded Concrete Cylinders" (ASTM C 39). Test evaluation shall be conducted in accordance with provisions of ACI 318. Keep one Specimen in reserve.

Make one strength test for each 100 cu. yds. or fraction thereof for each mix design of concrete placed in any one day, except that in no case shall given mix design be represented by less than five tests.

Testing Laboratory shall be selected and paid by the Contractor out of the material testing allowance.

Report all test results to Architect, Structural Engineer, and Contractor on same day that tests are made.

Testing laboratory shall make and handle all test cylinders.

NON-CONFORMING MATERIAL

Any tested concrete material that fails to meet design strength at 28 days shall be removed and repoured. Substandard concrete may be allowed to remain if certified structurally adequate by a qualified independent engineer and approved by the Owner and Architect, however, the cost of the substandard material shall be deducted from the contract sum.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

DESCRIPTION OF WORK:

Work shall consist of providing specified finishes to all cast-in-place concrete shown on drawings.

RELATED WORK:

Coordinate with requirements and work specified in Specification Section 03362 - Polished Concrete Floor Finishes.

Coordinate with requirements and work specified in Specification Section -09400 – Terrazzo, requiring depressed concrete substrates.

INDUSTRY STANDARDS:

For listing of names of industry standard agencies mentioned by abbreviation in this Section refer to Industry Standards Index in Division 1.

SUBMITTALS:

Submit (in duplicate) Manufacturer's printed instructions for application of curing compounds and floor hardeners.

Coordinate with submittal requirements in Section 03362 – Polished Concrete Floor Finishes.

Coordinate with submittal requirements in Section 09400 – Terrazzo.

PART 2: PRODUCTS

FINE AGGREGATE: ASTM C 33, fine aggregate. Natural sand

PORTLAND CEMENT: ASTM C 150, Type 1, gray.

WATER:

Potable, and free of chemicals affecting set of cement.

CURING COMPOUND AND SEALER:

Transparent, resinous sealer, in volatile, conforming to ASTM C 309.

Coordinate with products specified in Section 03362 – Polished Concrete Floor Finishes.

Coordinate with product requirements specified in Section 09400 – Terrazzo.

LIQUID CHEMICAL FLOOR HARDENER:

Colorless, aqueous solution containing blend of magnesium fluosilicate and zinc fluosilicate with wetting agent, containing not less than 2 lbs. fluosilicates per gallon. Compound shall be approved by Architect in writing.

Coordinate with products specified in Section 03362 – Polished Concrete Floor Finishes.

ABRASIVE AGGREGATE:

Ceramically bonded aluminum oxide grains 1/8" to 1/32" size. Material shall be delivered to the site in the manufacturer's original container. Submit sample and manufacturer's descriptive data for approval.

JOINT SEALANTS:

Apply interior and exterior joint sealant products required by drawings at locations indicated on drawings.

PROTECTION:

Coordinate with protection requirements specified in Section 03362 – Polished Concrete Floor Finishes.

Coordinate with protection requirements specified in Section 09400 - Terrazzo.

PART 3: EXECUTION

PATCHING CONCRETE:

Concrete which is not formed as shown on Drawings, or is out of alignment or level, or shows defective surface, or shows defects which reduce structural strength of member or members, shall be considered as not conforming to intent of these specifications and shall be removed from job by Contractor at his expense, unless Architect grants permission to patch effective area. Permission to patch any such area shall not be considered a waiver of Architect's right to require complete removal of defective work if patching does not, in his opinion, satisfactorily restore quality and appearance of surface, or if patching does not restore structural strength of member or members.

After removing forms, inspect all concrete surfaces. Patch any pour joints, voids, honeycomb, stone pockets, or other defective areas permitted by Architect to be patched, and all tie holes. Where necessary, chip away defective areas to depth of not less than 1", with edges perpendicular to surface. Wet area to be patched and space at least 6" wide entirely surrounding it to prevent absorption of water from patching mortar. Brush grout of equal parts portland cement and sand (with sufficient water to produce brushing consistency) into surface, followed immediately by patching mortar. Patching mortar shall be made of same material (and of approximately same proportions) as used for concrete except that coarse aggregate shall be omitted. Mortar shall not be richer than 1 part cement to 3 parts sand. Amount of mixing water shall be as little as is consistent with requirements of handling and placing. Mortar shall be retempered without addition of water by allowing it to stand for period of one hour, during which time it shall be mixed occasionally with trowel to prevent setting.

Compact mortar thoroughly into place and screed off to leave patch slightly higher than surrounding surface. Leave patch undisturbed for period of 1 to 2 hours to permit initial shrinkage before beginning final finishing. Finish patch in manner to match adjoining surface. On exposed surface where unlined forms have been used, obtain final finish by striking off surface with straight-edge spanning patch, held parallel to direction of form marks. All patches shall be used in accordance with curing requirements for surface in which patch occurs. Keep patch moist for not less than 3 days after installation.

Tie-holes left by withdrawal of rods, or holes, left by removal of ends of ties shall be filled solidly with mortar after first being wet thoroughly. Any excess mortar at surface of wall shall be struck off flush with cloth.

FLATNESS AND LEVELNESS:

Comply with ACI Standard No. 117 and provide floors with a flatness of F25 and a levelness of F20. Use laser guided equipment to set all forms.

Use laser guided highway screed to achieve specified levelness and flatness. Use of BULLFLOATS is prohibited.

Areas of Integrally Colored and Dye Stained Polished Concrete Floor Finishes: Comply with ACI Standard No. 117 and provide floors with a flatness of minimum F50 and a minimum levelness of F30. Use laser guided equipment to set all forms. Use laser guided highway screed to achieve specified levelness and flatness. Use of BULLFLOATS is prohibited.

Level Tolerance of areas of Terrazzo: Depressed concrete sub-floor shall be level with a maximum variation from level of 1/4" in 10 feet.

TESTING:

Floors shall be tested for levelness and flatness by an independent testing agency, using a "Dipstick Floor Profiler". Floors that do not meet specification will be removed and re-constructed.

MONOLITHIC CEMENT FINISH:

Apply steel trowel finish to surface of concrete roof and floor slabs as follows:

- For all floors where, in Finish Schedule, resilient flooring or carpet covering is called for.
- For all roof slab areas (for future use as floor).
- For all other concrete floors, stairs, platforms, or slabs where, in Finish Schedule, or shown on Drawings, exposed concrete finish is called for, unless otherwise noted.

Screed floor slabs to an even surface by use of straight-edge and screeding strips accurately to proper grade. Float concrete with laser guided highway screed in manner which will compact and produce surface free from depressions or unevenness. Floors shall be level and flat within tolerances and guidelines specified, except where drains occur (in which cases floors shall be pitched to drains). Steel trowel concrete after concrete has hardened sufficiently to prevent fine materials from working to top, and only after all water sheen has disappeared. Drying of surface moisture before troweling shall proceed naturally, and shall not be hastened by dusting on of dry sand or cement. Perform final troweling after concrete has hardened so that no mortar accumulates on trowel and ringing sound is produced as trowel is drawn over surface.

Coordinate with requirements and work specified in Specification Section 03362 - Polished Concrete Floor Finishes.

Coordinate with requirements and work specified in Specification Section 09400 - Terrazzo.

Exterior Concreted Areas:

Provide all (walks and vertical surfaces) surfaces with a unidirectional fine broom finish, with concrete walk 1/2" tooled expansion joints at 30' centers maximum and sawcut joints at 5' centers maximum. Pour sample for Architect approval.

CURING:

General Requirements for Curing:

Prevent surfaces of concrete from drying out until required curing time has elapsed. Start curing procedures immediately following initial set of concrete.

Surfaces to Receive Finishes Set in Portland Cement Setting Beds and Terrazzo:

Cover with non-staining, reinforced kraft paper. Lap kraft paper, and keep weighted down to prevent evaporation. Do not use membrane curing compound on these surfaces.

FLOOR HARDENER:

Apply to floor surfaces to be exposed in accordance with Manufacturer's printed instructions, and at a rate of not less than 100 sq. ft. per gallon. Apply uniform coating to avoid mottled appearance.

GLOSS URETHANE FLOOR SEALER FOR EQUIPMENT PLATFORMS, BOILER ROOMS, MECHANICAL ROOMS, ELECTRICAL ROOMS, CUSTODIAL ROOMS: (Apply whether scheduled or not; typical)

After all areas are final cleaned, to include removal of all stains and exposed reinforcing fibers, apply clear gloss urethane to floor surfaces to be exposed (no floor finishes except sealer) in accordance with Manufacturer's printed instructions, and at a rate of not less than manufacture's application rate instructions and to achieve a permanent high gloss sheen. Apply uniform coating to avoid mottled appearance. Coordinate with Section 09900 requirements.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

1.1 SECTION INCLUDES

- A. Reinforcing steel bars, wire fabric and accessories for cast-in-place concrete.

1.2 REFERENCES

- A. ACI 301 - Structural Concrete for Buildings.
- B. ACI 318 - Building Code Requirements For Reinforced Concrete.
- C. ACI SP-66 - American Concrete Institute - Detailing Manual.
- D. ANSI/ASTM A82 - Cold Drawn Steel Wire for Concrete Reinforcement.
- E. ANSI/ASTM A184 - Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
- F. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
- G. ANSI/ASTM A496 - Deformed Steel Wire Fabric for Concrete Reinforcement.
- H. ANSI/ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
- I. ANSI/AWS D1.4 - Structural Welding Code for Reinforcing Steel.
- J. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
- K. ASTM A616 - Rail Steel Deformed and Plain Bars for Concrete Reinforcement.
- L. ASTM A617 - Axle Steel Deformed and Plain Bars for Concrete Reinforcement.
- M. ASTM A704 - Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.
- N. ASTM A706 - Low-Alloy Steel Deformed Bars for Concrete Reinforcement.
- O. ASTM A767 - Zinc-Coated (Galvanized) Bars for Concrete Reinforcement.
- P. ASTM A775 - Epoxy-Coated Reinforcing Steel Bars.
- Q. ASTM D3963 - Epoxy-Coated Reinforcing Steel.
- S. AWS D12.1 - Welding Reinforcement Steel, Metal Inserts and Connections in Reinforced Concrete Construction.
- T. CRSI - Concrete Reinforcing Steel Institute - Manual of Practice.
- U. CRSI 63 - Recommended Practice For Placing Reinforcing Bars.
- V. CRSI 65 - Recommended Practice For Placing Bar Supports, Specifications and Nomenclature.

1.3 SUBMITTALS

- A. Shop Drawings: Indicate bar sizes, spacings, locations, and quantities of reinforcing steel and wire fabric, bending and cutting schedules, and supporting and spacing devices.
- B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- C. Submit in writing any request for deviation from the design drawings and specifications.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with CRSI 63, 65 and Manual of Practice, ACI 301, ACI SP-66, ACI 318, ANSI/ASTM A184.
- B. Submit certified copies of mill test report of reinforcement materials analysis.

1.5 COORDINATION

- A. Coordinate with placement of formwork, formed openings and other Work.

PART 2: PRODUCTS

2.1 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615, 60 ksi yield grade; deformed billet steel bars, unfinished.
- B. Welded Steel Wire Fabric: ASTM A185 Plain Type; in flat sheets; unfinished. Rolled WWF shall not be acceptable for use on this job.

2.2 ACCESSORY MATERIALS

- A. Tie Wire: Minimum 16 gage annealed type.
- B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor barrier puncture.
- C. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Stainless steel type; size and shape as required.

2.3 FABRICATION

- A. Fabricate concrete reinforcing in accordance with CRSI Manual of Practice ACI SP-66, ACI 318 ANSI/ASTM A184.
- B. Locate reinforcing splices not indicated on drawings, at point of minimum stress. Indicate location of splices on shop drawings for approval by the Architect/Engineer.

PART 3: EXECUTION

3.1 HANDLING AND STORAGE

- A. Provide proper equipment for safe off loading and handling of material.

- B. Provide proper clean level storage area with proper skids to keep material clear of mud and water.
- C. Keep material free from mud and other deleterious materials that will reduce bond and do not place any reinforcing bars that are bent, twisted, broken, pitted, or otherwise unsuitable for use on the project as determined by the architect.
- D. All necessary field bending and straightening shall be accomplished without heating the material.
- E. Cutting torch shall be used only for cut off of material but not for bending. All heat bent material will be rejected by the inspector and shall be promptly removed and replaced at no additional cost. Do not weld reinforcing bars.

3.2 PLACEMENT

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position. WWF laying on the metal deck and being manually pulled up into the fresh concrete during concrete placement operations shall not be acceptable.
- B. Do not displace or damage vapor barriers. Damaged vapor barrier shall be removed and replaced at the direction of the Architect.
- C. Accommodate placement of formed openings.
- D. Maintain concrete cover around reinforcing as indicated on drawings.
- E. Provide proper and adequate supports at maximum 3 ft x 3 ft spacing each way for support of wwf in the designated position. Tie off wwf sheets so that placement of the fresh concrete will not cause the wwf to be displaced. Pulling up of the wwf sheets into freshly placed concrete will not be an acceptable means of placing the wwf.

3.3 FIELD QUALITY CONTROL

- A. Field inspection will be performed by the Architect.

END OF SECTION

RELATED DOCUMENTS:

The general provisions of the Contract, including General and Supplementary Conditions, and General Requirements, and Division 1 specifications that apply to the work specified in this Section.

PART 1 GENERAL:

1.01 DESCRIPTION OF WORK:

- A. Furnish And Install All Architectural Precast Concrete Units.
- B. Related Work Specified Elsewhere
 - a. LEED Requirements (Section 01405)
 - b. Division 3 Specifications

1.02 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

- A. American Concrete Institute (ACI) Publications:
 - 1. 211.1-81 Standard practice for selecting proportions for concrete.
 - 2. 214-77 (R83) Recommended practice for evaluation of strength test results of concrete.
 - 3. 301-84 Specifications for structural concrete for buildings.
 - 4. 304-73 Recommended practice for measuring, mixing, transporting, and placing concrete.
 - 5. 305r-82 Hot weather concreting.
 - 6. 306r-78 Cold weather concreting.
- B. American Society for Testing Materials (ASTM) Publications:
 - 1. A 36-81a Structural steel.
 - 2. A 185-79 Welded steel wire fabric for concrete reinforcement.
 - 3. A 283-81 Low and intermediate tensile strength carbon steel plates, shapes, and bars.
 - 4. A 615-82 Deformed and plain billet-steel bars for concrete reinforcement.
 - 5. C 31-84 Making and curing concrete test specimens in the field.
 - 6. C 33-84 Concrete aggregates.
 - 7. C 39-83b Compressive strength of cylindrical concrete specimens.
 - 8. C 94 Concrete batch plant, mixer, mixing and measuring.
 - 9. C 150-84 Portland cement.
- C. Prestressed Concrete Institute (PCI) and Architectural Precast Association (APA) Publications:
 - 1. MNL 117-77 Manual for quality control for plants and production of Architectural Precast Concrete products.
 - 2. 2nd edition Architectural Precast Concrete
- D. LEEDS NC, U. S. Green Building Council

1.03. SUBMITTALS:

- A. Shop drawings and descriptive data: Before manufacture of A.P.C. units, submit and obtain approval for shop drawings and descriptive data including the following:
 - 1. Layout, dimensions, cross sections, and edge details, location and type of reinforcement including reinforcement for safe handling.
 - 2. Design calculations showing compliance with indicated loading conditions.

3. Setting drawings for A.P.C. units and anchors.
- B. Manufacturer's Mix Design:
 1. Submit a mix design for the Architectural Precast Concrete including a complete list of materials with brand names and sources.
 2. Provide test reports indicating that mix has been tested to meet properties specified.
 3. Obtain approval before proceeding with manufacture.
- C. Catalog Data:
 1. Architectural Precast Concrete producer's literature and company information.
 2. Plant certification information
 3. Anchorage information.
 4. Joint sealant information
- D. Samples: Samples to be submitted as follows:
 1. Submit Architectural Precast Concrete samples to illustrate quality, color and finish.
 2. Smooth form finish
 3. Colors to match available standard colors of Seaboard Concrete Products Company
- E. LEEDS NC: Submit certification from Manufacturer of materials and accessories that products are sustainable products, listing all applicable LEED U.S. Green Building code council's credits made available by certification. Coordinate with and comply with Section 01405 LEED Requirements and Materials Documentation Submittal Cover Sheet.

1.04.1 DELIVERY AND STORAGE:

- A. Deliver Architectural Precast Concrete units on supports designed for the protection of these units, or packed and wrapped on pallets for job site storage.

PART 2 PRODUCTS

2.01 CONCRETE:

- A. Manufacturer's Mix Design:
 1. Concrete shall have a 28 day compressive strength of 5,000 PSI and a 4 to 6 percent of water absorption.
- B. Concrete Mix Materials:
 1. Provide aggregates, sand, mineral pigments, Admixtures and White Portland Cement to produce concrete with the specified properties and capable of obtaining the approved color and smooth form finish.
- C. Backing Mix:
 1. Back up mix not allowed, cast units solidly with one concrete mix.
- D. Colors: Colors shall be selected by the Architect from manufacturer's standard colors.

2.02 MATERIALS:

- A. Aggregates:
 1. Aggregates shall be natural white stone particles to match the smooth form finish sample on file.
- B. Cement:
 1. White Portland Cement,
 2. ASTM C 150-84,
 3. Type I or II

- C. Admixtures:
 - 1. ASTM C 494.
 - 2. Calcium chloride shall not be used.
 - D. Water: Potable
 - E. Reinforcement:
 - 1. Reinforcement bars:
 - a. ACI 301.
 - b. Galvanized after fabrication.
 - 2. Welded wire fabric:
 - a. ASTM A 185 OR ASTM A 497. Galvanized.
 - F. Threaded type concrete inserts:
 - 1. ASTM A 47 OR ASTM A 27. Plated or Galvanized.
 - G. Weld plate anchors:
 - 1. ASTM A 36 Steel. shop painted.
 - H. Flashing reglets:
 - 1. Galvanized sheet metal.
 - I.. Clip angles:
 - 1. ASTM A 36 Steel. Shop painted.
 - J. Dowels:
 - 1. ASTM A 36 Steel. Galvanized.
- 2.03 **UNIT FABRICATION:**
- A. Formwork and fabrication tolerances:
 - 1. Provide metal, concrete, wood or rubber forms, designed and built to resist deformation.
 - 2. Provide dimensional tolerances as follows:
 - a. Overall unit dimensions - plus/minus 1/8 inch.
 - b. Cross sectional dimension – plus/minus 3/16 inch.
 - c. Deviation from square – not to exceed 1/8 inch.
 - d. Anchor location – plus/minus 1 inch.
 - B. Reinforcement:
 - 1. ACI 301. Properly place, locate, and secure reinforcing bars and welded wire mesh.
 - C. Concrete mixing and measurement:
 - 1. ASTM C 94.
 - D. Concrete placement:
 - 1. ACI 303 AND MNL 117-77.
 - 2. Deposit concrete continuously into forms to prevent formation of planes of weakness in units.
 - 3. Place concrete within a temperature range between 50 and 90 degrees f.
 - 4. Consolidate concrete to prevent segregation and to produce a dense concrete, free of honey combs.
 - 5. Units shall be made by the “wet pour” process.
 - 6. The “dry tamp” method will not be accepted.
 - E. Identification markings:

1. Mark each unit to correlate with approved shop/setting drawings.
 2. Do not locate markings on finished surfaces.
- F. Exposed to view finished surfaces:
1. Smooth, formed finish on all finished faces.
- G. Concealed surfaces:
1. Provide a form or troweled surface.
- H. Curing:
1. Maintain units in a damp environment until concrete attained 60% of design strength.
- I. Manufacturer:
1. Producer to be Seaboard Concrete Products Company or an approved equal fabricator.
 2. Manufacturing facility is to be a "certified plant" under the Certification programs of the Architectural Precast Association (APA) or the Prestressed Concrete Institute (PCI).

PART 3 – EXECUTION

3.01 **Installation:** Install Architectural Precast Concrete units in accordance with approved shop drawings and descriptive data, and as specified below:

- A. Building framing system:
1. Allow for adjustment to compensate for sagging in the structural steel members as the architectural precast concrete units are erected.
- B. Placing units:
1. Provide temporary supports and bracing as required to maintain unit position and alignment during attachment to the building.
 2. Properly weld/bolt all connections after units are positioned.
- C. Erection tolerances:
1. Locate units to accommodate adjacent materials, proper joint width, and alignment with adjacent.
 2. Units dimensional tolerances are:
 - a. Joint width - +/- 3/16 inch
 - b. Unit alignment- +/- 1/4 inch
- D. Joints:
1. Joint sealants specified under section 07920: sealants.
- E. Protection:
1. Protect exposed surfaces from staining and construction damage.
 2. Extra care shall be taken to avoid damage and staining from tar used in the roofing operation.
- F. Cleaning:
1. Thoroughly clean all Architectural Precast Concrete units after installation.
 2. Use detergent, SUR-clean, and ample water, using a brush to scrub clean.
- G. Sealing:
1. Seal with liquid sealer products per manufacturer's directions as specified in 09900 Paint

PART 4 – QUALITY CONTROL:

4.01 Product Quality:

- A. Provide a quality control program as mandated under the Plant certification programs of either the APA or PCI.

- B. Rejection: Units may be rejected for the following deficiencies:
 - 1. Nonconformance to specified tolerances,
 - 2. Damage incurred during construction,
 - 3. Ragged or irregular edges,
 - 4. Honeycombs/voids on finished surfaces,
 - 5. Excessive variation in color or finish from approved sample, or unit to unit,
 - 6. Form lines or irregular surfaces,
 - 7. Visible repairs or cracks,
 - 8. Surface crazing.
 - 9. Defective sealer coat
 - 10. Unacceptable workmanship

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

DESCRIPTION:

Work Included: The work required under this Section includes furnishing all labor, equipment, materials, and services necessary to complete the brick and masonry block work indicated on the Drawings, or specified herein.

QUALITY ASSURANCE:

Qualifications of Workmen: The masonry work shall be accomplished by experienced masons under the direct supervision of a journey man mason.

Codes and Standards: In addition to complying with all pertinent codes and regulations, material and workmanship shall comply with standards of the National Concrete Masonry Association and the Structural Clay Products Institute.

SUBMITTALS:

Samples: Within thirty (30) days after award of Contract, and before any brick or unit masonry materials are delivered to the job site, submit samples as required of the proposed brick and concrete masonry units to the Architect for his approval.

Certification: Prior to delivery of concrete unit masonry to the job site, deliver to the Architect a letter from the manufacturer of the concrete masonry units certifying that all such concrete masonry units delivered to the job site are in strict conformance with the provisions of this Section of these Specifications.

Sample Panels: Before the masonry work is started, approved sample panels approximately 5 feet long by 4 feet high and of the proper thickness shall be constructed at the job site, reviewed and approved by the Architect. One face shall show the workmanship, coursing, bond, mortar joint thickness, tooling of joints, and range of brick color and texture, all to be as specified or selected by the Architect/Engineer. Sample panel shall duplicate the wall assembly construction with the thru-wall flashing and weep system, and a window opening with frame/sill/flashing weep assembly. The finished work shall match the approved sample panel. Mock up to be maintained throughout construction for workmanship reference.

PRODUCT HANDLING:

Protection: Use all means necessary to protect brick and concrete masonry materials before, during, and after installation and to protect the installed work and materials of all other trades. Cover masonry blocks and brick to prevent excessive moisture absorption.

Portland Cement, lime, and/or pre-packaged mortar mixes shall be delivered to the site and stored in unbroken bags or other approved containers. These materials shall be stored in dry, weather tight sheds or enclosures with elevated floors, which will prevent the inclusion of foreign materials and damage by water or dampness. Masonry sand shall be delivered and stored in a manner to prevent inclusion of foreign material. Brick shall be delivered and stored on the job site on platforms or timbers, clear of the ground. Brick which are chipped, cracked, broken, or marred in other manner shall not be used where exposed to view.

PART 2: PRODUCTS

CONCRETE MASONRY UNITS:

General: All concrete masonry units shall be of sizes shown on Drawings, two-cell type, in gray or neutral color, and conforming with ASTM C-90 Standard Specification for Load Bearing Concrete Masonry Units.

Provide units with bullnosed exterior corners at all exposed areas, bullnose profile to be laid from finish floor line up.

Provide factory preformed 45 degree corner units.

Standard Grey CMU:

Size: As indicated in the drawings

Color: Standard Color and Texture.

Minimum Net Area Average Compressive Strength: Average of three units 1900 PSI, no individual unit less than 1700 PSI.

Maximum Absorption: Absorption is less than 18 lbs/CF.

Weight Classification: Units shall be lightweight, blended with expanded shale, clay or slate, produced by the rotary kiln process and shall comply with ASTM C331 and ASTM C33 and shall be graded to assure consistent texture.

All units shall be free of organic impurities that will cause rusting, staining, or pop outs and shall contain no combustible material. All lightweight material to be manufactured by rotary kiln process. The use of coal burning power plants residue aggregate (bottom ash) or similar waste products will not be allowed.

The producer of the lightweight concrete masonry units shall furnish a letter of certification stating that all lightweight aggregate used in the manufacturer of the units was expanded shale, clay or slate produced by the rotary kiln process, Big River industries or approved equal conforming to ASTM C331 and ASTM C33.

Acceptable Manufacturers:

Adams Products Company - Oldcastle, Johnson Concrete Company or approved equal. Manufacturer other than approved listed shall provide submittal samples and received written approval by the Architect prior to bid.

BRICK:

Common brick to be modular size, nominal 2 ¼" x 4" x 8", and shall conform to ASTM C-62, grade MW, use below grade and where not exposed.

Face Brick shall be modular size, nominal 2 ¼" x 4" x 8", matching existing brick, and conforming to ASTM C-69, grade SW, use for all exposed brick. Provide all brick types, sizes, shapes, and colors, in patterns as scheduled and indicated on Drawings.

MORTAR:

General: Cementitious materials and aggregates shall be handled and stored in such a manner as to prevent deterioration or intrusion of foreign materials. Each material shall be of like brand; all sand shall be supplied from a single source; sand color to be approved by Architect.

Cement: Shall be Portland Cement, Type I or II, meeting Standard Specifications for Portland Cement (ASTM C-150).

Sand: Shall be clean, washed, and meet the requirements of Standard Specification for Aggregate or Masonry Mortar (ASTM C-144-76), with the gradation to satisfy paragraph 3, Grading, and with the omission of subparagraph 3.4.

Hydrated Lime: Shall meet the requirements of the Standard Specification for Hydrated Lime for Masonry Purposes (ASTM C-207), Type S.

Hydraulic Hydrated Lime: Shall meet the requirements of the Standard Specification for Hydraulic Hydrated Lime for Structural Purposes (ASTM C-141).

Color: Mortar shall be matched to the existing mortar.

Water: Shall be potable.

Admixture-workability and air entraining admixtures may be utilized and shall conform to ASTM C-260.

Portland Cement: ASTM C-10, or Fed. Spec. SS-C-192, Type I, II, or III.

Aggregates: ASTM C-144, aggregate for masonry mortar.

Water: Shall be clean and free of deleterious amounts of acids, alkalies, or organic materials.

Plasticizing Agent: Shall be OMICRON by Master Builders, "Hydrocide Powder", by Sonneborn Bldg. Products, Inc., Subsidiary of DeSoto, Inc., "Hydrolox 400" by Chem-Masters Corp., or approved equal, and used in accordance with mfgs. instructions.

Anti-Freeze Compounds: No anti-freeze liquid, salt, accelerating admixture for masonry mortar or other substance shall be in the mortar to lower the freezing point of the mixing water or accelerate the set of the cement.

Prepackaged Mortar Mixes: Prepackaged mortar mixes may be used with the prior approval of the Architect. The mortar mix shall be in accordance with the following specifications.

Type S Mortar Mix: The mortar mix shall have a compressive strength of 1800 psi minimum at 28 days when tested in accordance with ASTM C-270.

The mortar mix shall contain Portland Cement, hydrated lime, plasticizing admixtures, and/or hydraulic hydrated lime. Mortar mixes which contain other materials, including ground limestone ground slag or other cementitious and non-cementitious materials, are not acceptable.

Bag Label: Each bag of mortar mix shall have a printed label thereon which shall show the contents. Contents shall be described by the percent by volume of Portland Cement (ASTM C-150).

Hydrated Lime (ASTM C-207), Hydraulic Hydrated Lime (ASTM C-141), and Admixtures (ASTM C-260).

Instructions for mixing the mortar mix shall be clearly printed on the container. These instructions shall be by volumetric measurement and shall be limited to the method of mixing in proper proportions of washed sand to 1 bag of the prepackaged mortar mix with water to produce a flow of the proper consistency.

The mortar mix shall be composed only of Portland Cement, Hydrated lime and/or Hydraulic Hydrated Lime and workability admixtures within the following limits:

- a. Maximum of 65% Portland Cement.
- b. Minimum of 33% Hydrated Lime and/or Hydraulic Hydrated Lime.
- c. Maximum of 2% Admixtures.

Air Content: The air content of the pre-packaged mortar mix shall be limited to 16% maximum when tested in accordance with ASTM C-91, Paragraphs 18 through 22.

Autoclave Expansion: Autoclave expansion of the mortar mix shall not exceed 1.0% when determined in accordance with ASTM Method C-151.

On-The-Job Mortar Mix:

Type S. Mortar shall have a compressive strength of 1800 psi minimum at 28 days. The mortar shall be proportioned within the following volumetric limits:

- a. 1 part Portland Cement
- b. 1/2 part Hydrated Lime
- c. Not less than 2 1/4 and not more than 3 times the sum of the volumes of cement and lime used of washed sand measured in a damp, loose condition.
- d. Plasticized per instructions of the mfr., the quantity of which is not to exceed 2% by volume of the cement and lime combination.

Measurement and Mixing:

The method of measuring materials shall be by volume and shall be such that the specified proportions of the mortar materials can be controlled and accurately maintained. A measuring device to make consistent volume measurements shall be used throughout the project. Measurement of washed sand by shovel shall not be permitted.

Mortar Mixer shall be a paddle-type mechanical mixer. It shall be of such design and size to accommodate the mix without overloading, and be adequately powered to vigorously mix the ingredients.

The mortar mixer shall be charged in this order: Add approximately one-half the water required, one-half the washed sand, the cement and lime or prepackaged mortar mix), the remaining amount of washed sand, and then sufficient water to bring the mix to desired consistency. Mortar shall be mixed for a minimum of five minutes after all materials have been charged into the mixer with all batches being mixed to the same consistency.

Mortars that have stiffened because of evaporation of water from the mortar may be retempered by adding water as frequently as needed to restore the required consistency. Mortars shall be used and placed in their final position within 2 hours after mixing. When the temperature is over 80 degrees F., the mortar shall be used within 1 1/2 hours after mixing. Mortar not used within these time periods shall be discarded.

HORIZONTAL JOINT REINFORCEMENT STEEL:

Standards:

Joint Reinforcement for CMU/Brick Veneer Cavity Wall: Truss type in CMU backup wall with hook and key eye; steel wire, hot dip galvanized to ASTM A 153 after fabrication, cold drawn steel wire conforming

to ASTM A82, 3/16 inch side rods with No.9 diagonal ties. Backup wall reinforcing shall be units no more than two (2) inches smaller in width than the wall thickness and shall be of deformed rods 3/16" side rods and 9 gage diagonal cross rods all galvanized. Veneer anchored with 3/16" keys and hooks, keys are 4-point flush-welded to backup wall rods. Total unit width shall be no more than two (2) inches smaller in width than the total wall thickness. Hooks shall be extended into veneer wythe 1" from exterior face. Provide Hohmann & Barnard LOX-ALL Adjusto-Flex-Mesh #AF-H Truss, Wire-Bond Series 700 adjustable tab, Dur-O-Eye by Dayton Superior or approved equivalent products.

Interior CMU wall reinforcing shall be Truss Type, as mfgd. by AA Wire Products Co., "DUR-O-WALL", Hohmann & Barnard "LOX-ALL", or other approved equal products. Provide prefabricated corners and intersections. Manufactured in accordance with Uniform Building Code Standard UBC 21-10, ASTM A951, ASTM A580 – Type 304, ACI 530/ASCE 5/TMS402 Building Code Requirements for Masonry Structures.

Reinforcing shall be units no more than two (2) inches smaller in width than the wall thickness and shall be of deformed rods 3/16" side rods and 9 gage diagonal cross rods all galvanized.

Provide galvanized hardware cloth and prefabricated Tees and Corners at all wall intersections.

Interior block partitions shall be reinforced similar to exterior walls.

Spacing: Reinforcing for exterior and interior walls shall be 16" o.c. vertically beginning at the finish floor line and provide line of reinforcing one block course and one below all window heads and sills. Extend 16" beyond jambs on each side.

Lap all splices one full panel of reinforcing unit.

WALL TIES TO STRUCTURAL STEEL:

All exterior and interior masonry walls shall be tied to contiguous steel columns and beams with two piece adjustable tie units such as Heckmann 12 gage 315-D, Hohmann and Barnard 12 gage DW-10HS, or 12 gage Wire-Bond Type III anchors with 3/16 diameter triangular wire ties or approved equal.

Space wall ties to columns and beams at 16" oc maximum. Tie anchors shall be welded to structural steel with 4 fillet welds 1/8" x 3/4".

WALL TIES TO LIGHT GAGE METAL WALL STUDS

All exterior masonry veneer with metal stud back up shall be tied to metal studs with two piece adjustable tie units such as Heckmann 12 gage 315-D, Hohmann and Barnard 12 gage DW-10HS, or 12 gage Wire-Bond Type III anchors with 3/16 diameter triangular wire ties or approved equal.

Space wall ties so that no tie is required to tie more than 2 2/3 square feet of masonry veneer or 24" oc maximum. Tie anchors shall be attached to metal studs with 2 - #12 self drilling self tapping screws.

FLASHING SYSTEM:

Thru-Wall Flashing system: 40 mil thick EPDM rubber membrane, containing no asphalt, equivalent to Sandell EPDM Rubber Thru-wall Flashing with Carlisle SecurTape splicing tape, and continuous pre-formed stainless steel drip edge. Install in compliance manufacturer's instructions.

Thru-wall flashing shall be completely secured into masonry joints or surface fully adhered throughout all wall assemblies, with all lap joints 100% sealed, in a complete continuous waterproof installation. Provide all necessary accessory components for a complete assembly; to include required roll-on primers, spray adhesives, pressure sensitive adhesive tape, termination bars, etc. wherever necessary.

Locations: Wall flashing system shall be installed over all masonry opening heads and sills, over all lintels in exterior walls, at all weephole locations, continuous around columns, and elsewhere indicated on Drawings.

Build a mock-up installation into the masonry sample panel for review and approval by Architect.

Required Thru-Wall Flashing Accessories:

Carlisle SecurTape Splicing Tape: 3" wide x 100' long roll, double-sided, synthetic cured rubber EPDM adhesive tape, .030" thick. Features a clear poly release film. Apply to cleaned EPDM flashing lap seams and adhere tightly with roller. Primers and spray adhesives shall be applied to surfaces to receive adhesive tape.

Sando-Seal lap sealant: Apply to all exposed edges at surface applied conditions, eliminating any voids, pockets or depressions where moisture would accumulate.

Sandell's S-600 Primer: Manufacturer's special primer formulated to prepare surfaces for adhering flashing to surfaces with pressure sensitive adhesive tape.

Sandell's Self-Adhering End Dams: preformed rubberized asphalt with adhesive surface and release layer film. Install above and beneath all wall openings, all longitudinal ends of flashing, lintel ends, at column abutments, near building expansion joints, and all cavity wall conditions whenever flashing interruptions occur.

Sandell's Self-Adhering Corners: preformed rubberized asphalt with adhesive surface and release layer film. Install at exterior and interior corner conditions. Flashing membrane shall overlap preformed corners, adhere and form a continuous waterproof seal.

Pre-Formed Stainless Steel Drip Edge: Provide a continuous pre-formed stainless steel drip edge at all flashings. 28 gauge, dull finish Type 304 stainless steel, ASTM A-167. Minimum 1 5/8" wide with a 3/8" bent safety drip edge. Flashing membrane shall lap and adhere onto drip edge for a continuous waterproof assembly. Flashing membrane shall be terminated at 1/2" from face of finished wall surface.

Weeps: Plastic weep inserts shall be Cell Vent Weep-Hole Ventilator by DUR-O-WALL or equivalent. 3/8" thick x full head joint height equivalent to brick size height, color clear. Install at all wall flashing locations with weepholes indicated on Drawings.

PART 3: EXECUTION

SURFACE CONDITIONS:

Inspection:

Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

Verify that concrete unit masonry may be completed in accordance with all pertinent codes and regulations, referenced standards, and the original design.

Discrepancies: In the event of discrepancy, immediately notify the Architect. Do not proceed with installation in areas of discrepancy until all such discrepancies have been completely resolved.

COORDINATION:

Carefully coordinate with all other trades to insure proper and adequate interface of the work of other trades with the work of this Section.

INSTALLATION OF MASONRY:

GENERAL: Lay up all walls in running bond, plumb, level, and true to the lines and dimensions indicated on the Drawings. Maintain uniform head and bed joint of 3/8" vertically and horizontally. Masonry Contractor shall use sled runner jointing tool wherever possible to maintain consistency.

Do not use chipped or broken units. If any such units are discovered in the finished wall, the Architect may require their immediate removal and replacement with new units at no additional cost to the Owner.

Wetting of Brick: All brick shall be thoroughly wetted as necessary to reduce the rate of absorption of water a time of laying to not more than 0.7 of an ounce (20 grams per minute) per brick when placed on its flat side in 1/4" of water for one minute.

Brick Laying Technique:

All joints between brick shall be completely filled with mortar. Brick shall be laid in a full, lightly furrowed bed of mortar with the head joints completely filled by placing sufficient mortar on the end of the brick so that when the brick is shoved into place, the head joint will be filled. Buttering of face edge and then slushing will not be permitted. All joints, both interior and exterior shall be cut flush.

Disturbed Units: Where brick are disturbed or must be moved after the mortar has begun to lose its moisture, the brick and all adjacent mortar shall be removed and reset completely.

Tooling: Exterior and Interior brick joints shall be tooled to a uniform concave joint (unless otherwise noted) using a metal tool designed for that purpose, head joints first and then the bed joints. Interior CMU joints shall be tooled to a uniform concave joint. All joints shall be tooled at approximately the same degree of moisture content and firmness to achieve a uniform color and texture.

Where indicated provide raked tooled joints.

POINTING OF MASONRY:

At the completion of the masonry work, all holes in the exposed masonry shall be pointed. Defective joints shall be cut out and tuckpointed solidly with mortar. Pointing and tuckpointing shall be done with a pre-hydrated mortar. The mortar mix shall be controlled so that after curing of the mortar, no difference in texture or color exists with that of adjacent masonry. Where indicated, provide tuckpointing of existing masonry.

COLD WEATHER:

No bricklaying shall be performed unless the temperature of the surrounding air is 40 degrees F. and rising. The use of "anti-freeze" or accelerating admixtures is not permitted. Provide temporary protection of completed portions of masonry to insure a minimum 48 hours curing at a minimum 40 degrees F.

MASONRY OPENINGS:

The General Contractor and/or his masonry subcontractor shall be responsible for coordinating and building into all walls, the required openings necessary to permit the passage of duct work and piping by the mechanical contractors. These required openings shall be located and constructed as the work

progresses. Knocking out large openings after work has been constructed will not be permitted. Structural lintels shall be furnished and installed by the General Contractor.

MASONRY CLEANING:

While laying the brick, good workmanship and job housekeeping practices shall be used so as to minimize the need for cleaning the brick. Protect the base of the wall from mud splashes and mortar droppings, protect the wall by setting scaffolds so that mortar is not deflected onto the wall, and at the end of each work day set the scaffolding boards so that they do not deflect rainfall onto newly laid masonry.

The bricklaying technique shall be such that mortar does not run down the face of the wall, or smear the mortar onto the brick face.

After the joints are tooled, cut off mortar tailings with the trowel and brush excess mortar burrs and dust from the face of brick. Do not bag or sack the wall, but use a bricklayer's brush made with medium soft hair.

Remove all large mortar particles with a hardwood scraper.

If after using the above outlined techniques, additional cleaning of the walls is found necessary, allow the walls to cure one month prior to and at the time the cleaning solution is applied.

Clean the wall only with an approved cleaning solution applied as recommended by the manufacturer. The solution shall be applied with a brush starting at the top of the wall. The use of any proprietary cleaning agents shall first be approved in writing by the manufacturer of the masonry being cleaned and the Architect. The concentration, method of application of the cleaning solution, and method of scraping shall be as outlined on the container by the manufacturer.

High pressure water and sandblasting shall not be used for cleaning.

Immediately after cleaning a small area, the wall shall be rinsed thoroughly with quantities of water.

Protect adjacent surfaces and materials during brick cleaning operations.

After the walls are cleaned, take necessary precautions to insure that other contractors and subcontractors do not damage or soil the walls. Mud protection around the base of walls shall be left in place until the final grading work is done.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

1.1 SECTION INCLUDES

- A. Concrete masonry units.
- B. Reinforcement, anchorage, and accessories.

1.2 REFERENCES

- A. ACI 530-99 - Building Code Requirements for Masonry Structures.
- B. ACI 530.1-99 - Specifications For Masonry Structures.
- C. ASTM A82 - Cold-Drawn Steel Wire for Concrete Reinforcement.
- D. ASTM A123 - Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products.
- E. ASTM A525 - Steel Sheet, Zinc Coated, (Galvanized) by the Hot-Dip Process.
- F. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
- G. ASTM C55 - Concrete Building Brick.
- H. ASTM C90 - Load-Bearing Concrete Masonry Units.
- I. IMIAC - International Masonry Industry All-Weather Council: Recommended Practices and Guide Specification for Cold Weather Masonry Construction.
- J. IMIAC - International Masonry Industry All-Weather Council: Recommended Practices and Guide Specification for Hot Weather Masonry Construction.
- K. UL - Fire Resistance Directory.

1.3 SUBMITTALS

- A. Shop Drawings: Indicate bars sizes, spacings, locations, reinforcement quantities, bending and cutting schedules, supporting and spacing devices for reinforcement, accessories.
- B. Product Data: Provide data for masonry units and fabricated wire reinforcement and accessories.
- C. Design Data: Indicate required mortar strength, masonry unit assembly strength in all planes, supportive test data.
- D. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 530 and ACI 530.1.
- B. Maintain one copy of each document on site.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years experience.
- B. Installer: Company specializing in installing the Products specified in this section with minimum five years experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products in workmanlike manner to avoid damage to units.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Maintain materials and surrounding air temperature to minimum 40 degrees F 48 hours prior to, during, and 48 hours after completion of masonry work.
- B. Cold Weather Requirements: IMIAC - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.
- C. Maintain materials and surrounding air temperature to maximum 90 degrees F 48 hours prior to, during, and 48 hours after completion of masonry work.
- D. Hot Weather Requirements: IMIAC - Recommended Practices and Guide Specifications for Hot Weather Masonry Construction.

PART 2: PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. Hollow Load Bearing Block Units (CMU): ASTM C90, Type I - Moisture Controlled blended light weight with individual unit net area compressive strength of 1900 psi.
- B. Solid Load-Bearing Block Units (CMU): ASTM C90, Type I - Moisture Controlled blended light weight with individual unit net area compressive strength of 1900 psi.
- C. Concrete Brick Units: ASTM C55, Type I - Moisture Controlled blended light weight of same Grade, Type, and Weight as block units with individual unit net area compressive strength of 1900 psi.
- D. Size and Shape: Nominal modular size. Provide special units for 90 and 45 degree corners, bond beams, lintels, and bullnosed corners.

2.2 REINFORCEMENT AND ANCHORAGE

- A. Single and Double Wythe Joint Reinforcement: Truss type; steel wire, hot dip galvanized to ASTM A 153 after fabrication, cold drawn steel wire conforming to ASTM A82, 3/16 inch side rods with No.9 diagonal ties. Reinforcing shall be units no more than two (2) inches smaller in width than the wall thickness and shall be of deformed rods 3/16" side rods and 9 gage diagonal cross rods all hot dipped galvanized.
- B. Joint Reinforcement for CMU/Brick Veneer Cavity Wall: Truss type in CMU backup wall; steel wire, hot dip galvanized to ASTM A 153 after fabrication, cold drawn steel wire conforming to ASTM A82, 3/16 inch side rods with No.9 diagonal ties. Backup wall reinforcing shall be units no more than two (2) inches smaller in width than the wall thickness and shall be of deformed rods 3/16" side rods and 9 gage diagonal cross rods

all galvanized. Veneer anchored with 3/16" keys and hooks, keys are 4-point flush-welded to backup wall rods. Total unit width shall be no more than two (2) inches smaller in width than the total wall thickness. Hooks shall be extended into veneer 1" from exterior face. Provide Hohmann & Barnard Adjusto-Flex-Mesh #AF-H Truss or equivalent.

- C. Provide prefabricated Tees and Corners at all wall intersections.
- D. Interior block partitions shall be reinforced similar to exterior backup walls.
- E. Spacing: Reinforcing for exterior and interior walls shall be 16" o.c. vertically beginning at the finish floor line and provide line of reinforcing one block course and one below all window heads and sills. Extend 16" beyond jambs on each side.
- F. Lap all splices one full panel of reinforcing unit.

2.3 WALL TIES TO STRUCTURAL STEEL:

- A. All exterior and interior masonry walls shall be hot-dip galvanized, tied to contiguous steel columns and beams with two piece adjustable tie units such as Heckmann 12 gage 315-D, Hohmann and Barnard 12 gage #359FH Weld-On Ties, or 12 gage Wire-Bond Type III anchors, with 3/16 diameter triangular wire ties or approved equal. Refer to Drawings General Notes.
- B. Space wall ties to columns and beams at 16" oc maximum. Tie anchors may be welded to structural steel with 4 fillet welds 1/8" x 3/4".
- C. Reinforcing Steel: ASTM A615, 60 ksi yield grade, deformed] billet bars, uncoated finish.
- D. Strap Anchors: As indicated on the drawings.

2.4 MORTAR AND GROUT

- A. Mortar: Type "S".
- B. Grout: Ready Mix 3000 psi pea gravel concrete as specified in Section 03300.

2.5 ACCESSORIES

- A. Preformed Control Joints: Neoprene as noted on the drawings.
- B. Joint Filler: Closed cell type as noted on the drawings.
- C. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.6 LINTELS

- A. Bond beam type and steel lintels as noted on the drawings. Provide steel dowels to top flanges of steel beam lintels as noted on drawings. Provide dowels in bottom flanges of beams beyond the masonry openings as noted on the drawings.

2.6 EMBEDDED BEAMS

- A. Provide dowels in top and bottom flanges of beams embedded in masonry walls as noted on the drawings.

PART 3: EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Verify items provided by other sections of work are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.2 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied to other Sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.3 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
 - 1. Bond: Running.
 - 2. Coursing: One unit and one mortar joint to equal 8 inches.
 - 3. Mortar Joints: Concave.

3.4 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints are not permitted.
- D. Remove excess mortar as Work progresses.
- E. Interlock intersections and external corners unless otherwise noted on the drawings.
- F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- H. Cut mortar joints flush where wall tile is scheduled, cement parging is required, resilient base is scheduled, or bitumen damp proofing is applied.
- I. Isolate masonry partitions from vertical structural framing members with a control joint as indicated on drawings.

3.5 REINFORCEMENT AND ANCHORAGE

- A. Install horizontal joint reinforcement 16 inches oc.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 32 inches each side of opening.
- C. Place joint reinforcement continuous in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum one full panel.
- E. Support and secure reinforcing vertical bars from displacement with wire rod positioners as noted on the drawings. Maintain bars position within 1/2 inch of indicated position.
- F. Embed anchors attached to structural steel members. Embed anchorages in every second block joint.

3.6 LINTELS

- A. Install reinforced bond beam unit masonry lintels over openings where steel lintels are not scheduled.
- B. Do not splice reinforcing bars in lintels.
- C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of indicated position.
- D. Place and consolidate grout fill without displacing reinforcing.
- E. Allow masonry lintels to attain specified strength before removing temporary supports.
- F. Maintain minimum 8 inch bearing on solid masonry or steel on each side of opening.
- G. Refer to drawings for placement of control joints at ends of lintels.

3.7 GROUTED COMPONENTS

- A. Reinforce 8" wide bond beams with 1 - #5 top bar and, and 1 - #5 bottom bar 1 inch clear from bottom web. Reinforce 12" wide bond beams with 2 - #5 top bars and, and 2 - #5 bottom bars 1 inch clear from bottom web.
- B. Reinforce interior walls with #5 vertical bars spaced at 48" oc unless otherwise noted on the drawings. Place bars in maximum 6'-8" lifts. Lap splices 32", unless otherwise noted on the drawings.
- C. Reinforce exterior walls with #6 vertical bars spaced at 24" oc unless otherwise noted on the drawings. Place bars in maximum 6'-8" lifts. Lap splices 36", unless otherwise noted on the drawings.
- D. Place vertical bars in center of wythe.
- E. Lap splices in horizontal bars minimum 40 bar diameters. Stagger splices in adjacent bars. Dowel horizontal bars through HSS Steel column as noted on the drawings.
- F. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- G. Place and consolidate grout fill in 80" maximum lifts in cores containing bars without displacing reinforcing. Use water reducing plasticizers as required to maintain proper slump for grouting cells 100% solid.

- H. At lintel bearing locations, fill masonry cores with grout for a minimum of 24 inches each side of opening from lintel bearing down to finish floor.
- I. Grout all masonry units 100% solid below finish floor and other locations noted on the drawings.
- J. Lay masonry units with core cells vertically aligned.
- K. Permit mortar to cure 7 days before placing grout.
- L. Reinforce masonry unit cores and cavities with reinforcement bars and grout as indicated on drawings.
- M. Retain vertical reinforcement in position with wire rebar positioners spaced at 48" maximum intervals full height of masonry.
- N. Wet masonry unit surfaces in contact with grout just prior to grout placement.
- O. When grouting is stopped for more than one hour, terminate grout 1-1/2 inches below top of upper masonry unit to form a positive key for subsequent grout placement.
- P. High Lift Grouting:
 - 1. Clean out masonry cells and cavities with high pressure water spray. Permit complete water drainage.
 - 2. Request inspection prior to grouting. Allow 3 days advance notice of inspection.
 - 3. After cleaning and cell inspection pump grout into spaces. Maintain water content in grout to intended slump without aggregate segregation.
 - 4. Limit grout lift to 80 inches and rod or mechanically vibrate for grout consolidation unless self consolidating grout is utilized. Wait minimum 120 minutes before placing next lift. Do not damage masonry with hydrostatic pressure from the grouting operations.

3.8 CONTROL AND EXPANSION JOINTS

- A. Continue horizontal joint reinforcement through control joints.
- B. Do not continue horizontal joint reinforcement through expansion joints.
- C. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- D. Size control joint in accordance with Section 07900 for sealant performance.
- E. Form expansion joints as detailed.

3.11 BUILT-IN WORK

- A. As work progresses, install built-in metal door and glazed frames, fabricated metal frames, window frames, wood nailing strips, anchor bolts, and other items to be built-in the work and furnished by other sections.
- B. Install built-in items plumb and level.
- C. Bed anchors of metal door [and glazed] frames in adjacent mortar joints. Fill frame voids solid with grout. Fill adjacent masonry cores with grout minimum 24 inches from framed

openings.

- D. Do not build in organic materials subject to deterioration.

3.12 TOLERANCES

- A. Maximum Variation From Alignment: 1/4 inch.
- B. Maximum Variation From Unit to Adjacent Unit: 1/32 inch.
- C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and total 1/2 inch overall.
- D. Maximum Variation from Plumb: 1/4 inch per story.
- 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 Joint Thickness: 1/8 inch in 3 ft.

3.13 CUTTING AND FITTING

- A. Saw cut or core drill for neat fit at chases, pipes, conduit, sleeves. Coordinate with other sections of work to provide correct size, shape, and location. Fill space around penetrating devices with approved firestop materials.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.14 CLEANING

- A. Clean work with non acidic and non staining high pressure wash.
- B. Remove excess mortar and mortar smears as work progresses.
- C. Replace defective mortar. Match adjacent work.
- D. Clean soiled surfaces with cleaning solution.
- E. Use non-metallic tools in cleaning operations.

3.15 PROTECTION OF FINISHED WORK

- A. Protect finished Work form damage.
- B. Without damaging completed work, provide protective boards at exposed external corners which may be damaged by construction activities.

END OF SECTION

Water Penetration Resistance - Construction and Workmanship

Abstract: This *Technical Note* covers essential construction practices needed to assure water-resistant brick masonry. Procedures for preparing materials to be used in brick construction are recommended, including proper storage, handling and preparation of brick, mortar, grout and flashing. Good workmanship practices are described, including the complete filling of all mortar joints, tooling of mortar joints for exterior exposure and covering unfinished brick masonry walls to protect them from moisture.

Key Words: air space, brick, construction, flashing, initial rate of absorption, joints, mortar, tooling, weeps, workmanship.

SUMMARY OF RECOMMENDATIONS:

General

- Store materials on the job site to avoid wetting and contamination
- For drainage walls, keep the air space free of excessive mortar droppings
- Do not disturb newly laid masonry
- Cover tops of unfinished walls until adjacent construction protects them from water entry

Brick

- Pre-wet brick with a field measured initial rate of absorption (IRA) exceeding 30 g/min•30 in.² (30 g/min•194 cm²)

Mortar

- When mixing mortar, use accurate batching measurements and maximum amount of water that produces a workable mortar
- For brick with an IRA exceeding 30 g/min•30 in.² (30 g/min•194 cm²), increase water or maximize water retention by increasing lime proportions within limits of ASTM C 270
- For brick with an IRA lower than 5 g/min•30 in.² (5 g/min•194 cm²), reduce water or minimize water retention by decreasing lime proportions within limits of ASTM C 270

Joints

- In exterior wythes, completely fill all mortar joints intended to have mortar
- Minimize furrowing of bed joints and prohibit slushing of head joints
- Fill collar joints completely with grout or mortar, preferably grout; do not slush collar joints
- Tool mortar joints when thumbprint hard with a concave, "V" or grapevine jointer

Flashing and Weeps

- Do not stop flashing behind face of brickwork
- Where required, turn up flashing ends into head joint a minimum of 1 in. (25.4 mm) to form end dams
- Lap continuous flashing pieces at least 6 in. (152 mm) and seal laps
- Where installed flashing is pierced, make watertight with sealant or mastic compatible with flashing
- Install weeps immediately above flashing

INTRODUCTION

The best design, detailing and materials will not compensate for poor construction practices and workmanship. Proper construction practices, including preparation of materials and workmanship, are essential to achieve a water-resistant brick masonry wall.

This *Technical Note* discusses construction techniques and workmanship and is the third in a series of *Technical Notes* addressing water penetration resistance of brick masonry. Other *Technical Notes* in the series address brickwork design and details (7), materials (7A) and condensation (7C and 7D). Maintenance of brick masonry is addressed in *Technical Note* 46. All of these items are essential to obtain water-resistant brick masonry walls.

PREPARATION OF MATERIALS

Preparation of masonry materials before bricklaying begins is very important. Specific procedures must be followed to ensure satisfactory performance and avoid future problems. Preparation includes material storage, mixing mortar and grout and, in some cases, wetting the brick.

Storage of Materials

All materials at the jobsite should be stored to avoid contamination. Masonry units, mortar materials, ties and reinforcement should be stored off the ground, preferably in a dry location. In addition, all materials should be covered with tarpaulins or other weather-resistant materials to protect them from the elements.

Wetting Brick

Brick with an initial rate of absorption (IRA) greater than 30 g/min•30 in.² (30 g/min•194 cm²) at the time of laying tend to draw too much moisture from the mortar before initial set. As a result, construction practices should be altered when using brick with high IRA to achieve strong, water-resistant masonry. The IRA of brick in the field will typically be less than that reported in laboratory tests. Laboratory test results may be used to determine if measuring IRA in the field is necessary. ASTM C 67, Test Methods for Sampling and Testing Brick and Structural Clay Tile, includes a standard procedure for measuring IRA in the field.

A crude method of indicating whether brick need to be wetted prior to placement consists of drawing, with a wax pencil, a circle 1 in. (25.4 mm) in diameter on the brick surface that will be in contact with the mortar. A quarter can be used as a guide for the circle. With a medicine dropper, place 20 drops of water inside this circle and note the time required for the water to be absorbed. If the time exceeds 1½ minutes, the brick should not need wetting; if less than 1½ minutes, adjustments to typical construction practice are recommended.

Specification for Masonry Structures [Ref. 4] requires that brick with an IRA exceeding 30 g/min•30 in.² (30 g/min•194 cm²) be wetted prior to laying to produce an IRA less than 30 g/min•30 in.² (30 g/min•194 cm²) when the units are placed. However, execution of this method may be impractical on large-scale construction projects and the contractor may consider other alternatives, as discussed in the following section, Mixing of Mortar and Grout.

If brick are to be wetted, the method of wetting is very important. Sprinkling or dipping the brick in a bucket of water just before laying would produce the surface wet condition which may not be sufficient, as shown in [Figure 1b](#). The units should have a saturated interior, but be surface dry at the time of laying, as shown in [Figure 1d](#).

Satisfactory procedures for wetting the brick consist of letting water run on the cubes or pallets of brick, or placing them in a large tank of water. This should be done the day before the units are laid, or not later than several hours before the units will be used so that the surfaces have an opportunity to dry before the brick are laid. Wetting low-absorption brick or excessive wetting of brick may result in saturation, as shown in [Figure 1c](#). This can cause “bleeding” of the mortar joints and “floating” of the brick.

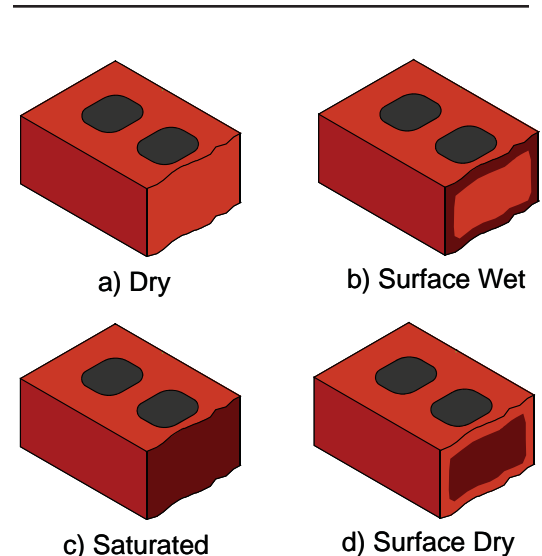


Figure 1
Moisture Content of Brick

Mixing of Mortar and Grout

Typically, a high water content in the mortar is necessary to obtain complete and strong bond between mortar and brick. In general the mortar should be mixed with the maximum amount of water that produces a workable mortar. Factors such as the jobsite environment and the IRA of the brick should be considered when determining the proper amount of water to include in the mortar.

Mortar to be used with brick that have an IRA greater than 30 g/min•30 in.² (30 g/min•194 cm²) should be mixed to maximize water retention by increasing mixing water or lime content within the limits of ASTM C 270. This is particularly important when pre-wetting the brick to reduce their IRA is impossible or impractical. Admixtures designed to increase the water retention of the mortar may also be used to improve the compatibility of mortar with high IRA brick. Only admixtures with test data showing no deleterious effects should be used.

Mortar for use with brick that have an IRA less than 5 g/min•30 in.² (5 g/min•194 cm²) should be mixed with reduced amounts of water or lime to minimize water retention. Lime proportions should remain within the limits of ASTM C 270.

When brick with widely different absorption rates are used together in brickwork, it is important to maintain the correct water content in the mortar used with the different brick.

All cementitious materials and aggregates must be mixed for at least 3 minutes and not more than 5 minutes in a mechanical batch mixer. If, after initial mixing, the mortar stiffens due to the loss of water by evaporation, addi-

tional water should be added and the mortar remixed (retempered). All mortar should be used within 2½ hr (2 hr in hot weather conditions, see *Technical Note 1*) of initial mixing and grout should be used within 1½ hour of introducing water into the mix. No mortar or grout should be used after it has begun to set.

One of the most common problems with mortar is oversanding. Oversanded mortar is harsh, unworkable and results in poor extent of bond and reduced bond strength, thus increasing the potential for water penetration problems. The cause of oversanding is frequently the use of the shovel method of measuring the sand. The amount of sand that a shovel will hold varies depending on the moisture content of the sand, the person doing the shoveling and the different size of shovels used on the jobsite. To alleviate this problem, proper batching methods must be used. Measurement of sand by shovel should not be permitted without periodically gauging the shovel count using a bucket or box of known volume. *Technical Note 8B* provides detailed guidelines for various methods of more accurately batching mortar.

Blending of Brick

While not related to water penetration resistance, blending of brick at the jobsite is an important preparation task related to workmanship and the acceptable appearance of brickwork. Because brick is made from natural materials that vary in physical properties, variations in color may occur between production runs and occasionally within the same run. Modern manufacturing processes use automatic equipment which may not permit inspection of each brick, also resulting in minor color and texture variations. For these reasons, straps of brick from different cubes should be placed together around the wall. The mason should then select brick from adjacent straps when laying a given section of brickwork. By blending the brick throughout the wall in this manner, the effect of potential color variations on the finished brickwork is minimized.

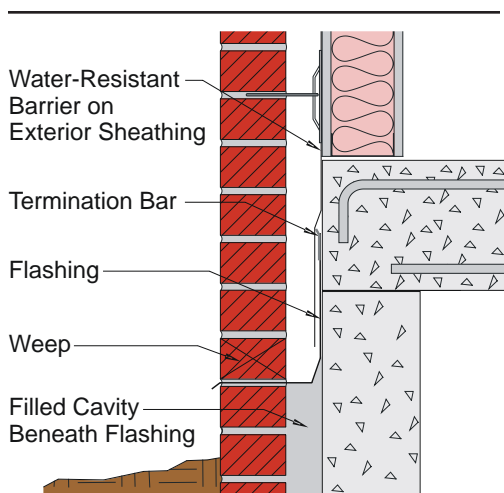


Figure 2
Wall Base Flashing Detail

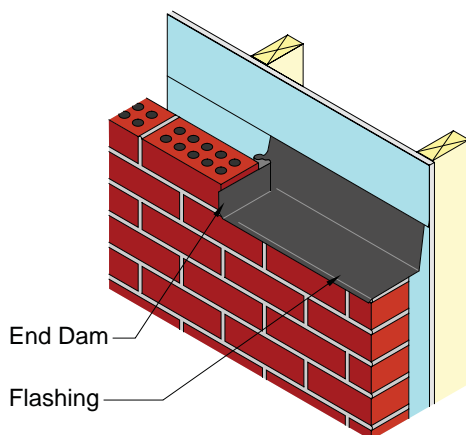


Figure 3
End Dam Detail

WORKMANSHIP

The importance of good workmanship to attain quality brickwork cannot be overemphasized. While design and the quality of materials contribute to the water penetration resistance of brickwork, workmanship is a highly important factor in the construction of water-resistant masonry.

Placing Flashing and Weeps

Flashing must be installed properly and integrated with adjacent materials to form an impervious barrier to moisture movement. The flashing should be wide enough to start outside the exterior face of the brick wythe, extend across the cavity, and turn up vertically against the backing or interior wythe at least 8 in. (203 mm). The top (vertical) edge should be placed in a mortar joint of the backing wythe, in a reglet in concrete backing, or attached to sheathing with a termination bar, as shown in **Figure 2**. Sections of flashing are to be overlapped at least 6 in. (152 mm) and the lap sealed with a compatible adhesive. Water-resistant sheet membranes should overlap the flashing in a shingle fashion by at least 6 in. (152 mm).

Flashing that is placed so that the outside edge projects from the face of the wall may be cut flush with the face of the brickwork. In no circumstances should the flashing be stopped behind the face of the brickwork. Continuity at corners and returns is achieved by cutting and folding straight sections or using preformed corner pieces. Discontinuous flashing should terminate with an end dam in a head joint, rising at least 1 in. (25.4 mm) as shown in **Figure 3**.

Flashing must be placed without punctures or tears. Openings created for reinforcement or anchors must be closed with a compatible sealant. Protection may be needed around bolts fastening shelf angles to the structure.

Weeps are required, and should be formed in mortar joints immediately above the flashing. Open head joints, formed by leaving mortar out of a joint, are the recommended type of weep. Open head joint weeps should be at least 2 in. (51 mm) high. Weep openings are permitted by most building codes to have a minimum diameter of $\frac{3}{16}$ in. (4.8 mm). The practice of specifying the installation of weeps one or more courses of brick above the flashing can cause a backup of water and is not recommended. Non-corrosive metal, mesh or plastic screens can be installed in open head joint weeps if desired.

Spacing of open head joint weeps at no more than 24 in. (610 mm) on center is recommended. Spacing of wick and tube weeps is recommended at no more than 16 in. (406 mm) on center. Weep spacing is permitted by most building codes up to 33 in. (838 mm) on center. If other than an open head joint weep is used, be sure the weep is clear of all mortar to allow the wall to drain (see *Technical Note 21C*). Rope wicks should be flush with, or extend $\frac{1}{2}$ in. (12.7 mm) beyond the face of the wall to promote evaporation. The rope should continue into the bottom of the air space, placed along the back of the brick and be at least 16 in. (406 mm) long.

Filling Mortar Joints

To reduce water penetration, there is no substitute for proper filling of all mortar joints that are designed to receive mortar. Improperly filled mortar joints can result in leaky walls, reduce the strength of masonry, and may contribute to disintegration and cracking due to water penetration and subsequent freezing and thawing.

A uniform bed of mortar should be spread over only a few brick, and furrowed lightly, if at all. Filled joints result when plenty of mortar is placed on the end of the brick to be laid and it is shoved into place so that mortar is squeezed out of the top of the head joint, as shown in **Photo 1**. After placement, mortar squeezed out of bed joint should be cut off prior to tooling, as shown in **Photo 2**. When placing closures, plenty of mortar is needed on the ends of brick in place and on the ends of the brick to be laid. The closure should be shoved into place without disturbing brick on either side, as shown in **Photo 3**.

Bed Joints. A bed joint is the horizontal layer of mortar on which a brick is laid. The length of time between placing the bed joint mortar and laying the succeeding brick influences the resulting bond. If too long a time elapses, poor extent of bond will result. Brick should be laid within 1 minute or so after the mortar is placed.

For solid brick, bed joints should be constructed without deep furrowing of the mortar, as full bed joints (covering the entire bedding surface) are an inherent requirement for water-resistant brick masonry construction. For hollow brick, bed joints may be laid with face shell bedding (mortar placed only on the front and back face shells). Both face shells must be completely covered with mortar.

Head Joints. A head joint, sometimes called a cross joint, is the vertical mortar joint between two brick. For both solid and hollow brick it is important that head joints be completely filled. The best head joints are formed by completely buttering the ends of the brick with mortar and shoving the brick into place against previously laid brick.



Photo 1
Shoving Brick into Place



Photo 2
Cutting Excess Mortar



Photo 3
Placing the Closure

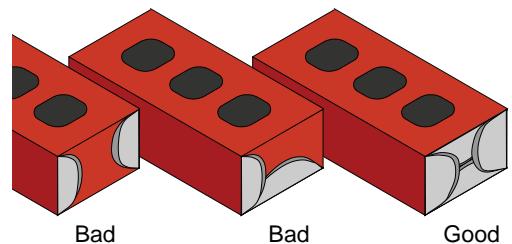


Figure 4
Head Joints



Photo 4
Concave Mortar Joints



Photo 5
"V" Mortar Joints

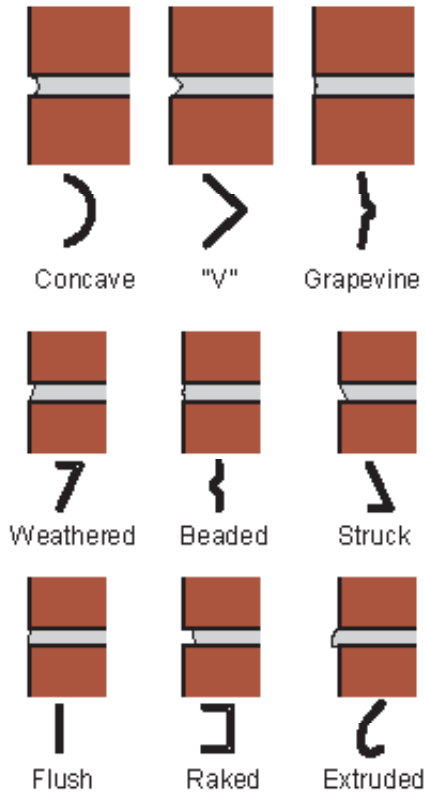


Figure 5
Typical Mortar Joints

"Slushing" ("throwing" mortar into the joint with the edge of a trowel) does not adequately fill joints or compact the mortar, resulting in joints that are less resistant to water penetration. The results of head joint forming are shown in [Figure 4](#).

Tooling of Mortar Joints

Proper tooling, or "striking", of mortar joints helps seal the wall surface against moisture penetration. Mortar joints should be tooled when they are "thumbprint" hard, (pressing the thumb into the mortar leaves an indentation, but no mortar is transferred to the thumb) with a jointer slightly larger than the joint. It is important that joints are tooled at the appropriate time as this affects both their effectiveness and appearance. Joints that are tooled too early often smear and result in rough joints. If tooling is delayed too long the surface of the joint cannot be properly compressed and sealed to the adjacent brick. Each portion of the completed brickwork should be allowed to set for the same amount of time before tooling in order to ensure a uniform mortar shade. Early tooling often results in joints of a lighter color. Later tooling results in darker shades.

Concave, "V" and grapevine joints best resist water penetration in exterior brickwork. These joints produce a more dense and weather-tight surface, as the mortar is pressed against the brick, as shown in [Photos 4 and 5](#). For interior masonry work, other joints such as the weathered, beaded, struck, flush, raked or extruded joints shown in [Figure 5](#) can also be used.

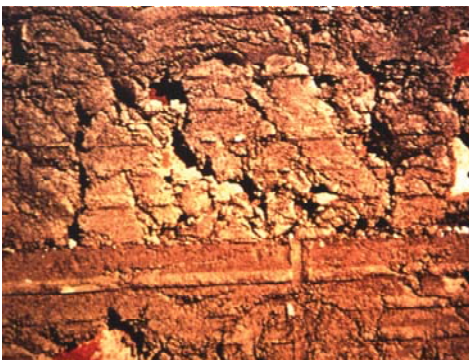


Photo 6
Poorly Filled Collar Joint

Collar Joints

The vertical, longitudinal joint between wythes of masonry is called a collar joint. The manner in which these joints are filled is very important. Grouting is the most effective method of ensuring that collar joints are completely filled. However, grouting spaces less than 3/4 in. (19.1 mm) is not permitted. Mortar protrusions (fins) that extend more than 1/2 in. (12.7 mm) into a cell or cavity that will be grouted must be removed prior to grouting. For mortar-filled collar joints, the outer face of the inner masonry wythe should be parged and the back of brick in the exterior wythe buttered in order to fill the collar joint.

"Slushing" of collar joints is not effective since it does not completely fill all voids in the joint, as shown in [Photo 6](#). Frequently, the mortar is

caught and held before it reaches the bottom of the joint, leaving openings between the face brick and the backing. Even when this space is filled, there is no way to compact the mortar. The mortar does not bond with the brick over its entire surface and channels are left between the mortar and the brick. Some of these channels may allow water to reach the back of the wall. A properly constructed collar joint is completely filled with grout or mortar.

Parging

Parging is the process of applying a coat of portland cement mortar to masonry. Parging the outer face of the inner wythe of a multiwythe wall with Type M or S mortar as damp proofing may help resist rain penetration and can also reduce air leakage. Membranes or liquid-applied materials usually provide superior performance to parging, which will crack if the wythe cracks. However, parging can provide a smooth base for these materials. If parging alone is to resist water penetration, proper curing is necessary to reduce shrinkage cracks. Parging the back side of the exterior wythe is not recommended for drainage-type walls, as this may result in more debris in the air space or break the brick/mortar bond.

The face of the wall to be parged must not have any mortar protrusions. Protruding mortar can cause bond breaks in the parge coat, resulting in a leaky wall. When applied in multiple layers, each should be a minimum thickness of ¼ in. (6.4 mm). The first coat should be allowed to partially set, roughened, and allowed to cure for 24 hours. It is then moistened for application of the second coat. The parged surface should be troweled smooth so that it sheds water easily. When completed in adjacent areas, the edges of the parging should be feathered and new parging should overlap existing parging by a minimum of 6 in. (152 mm). Lap joints should be spaced no closer than 6 feet (1.83 m).

Keeping Air Spaces Clean

In a drainage wall system, such as a cavity wall or an anchored veneer wall, it is essential that the air space be kept clean. If it is not, mortar droppings may clog the weeps, protrusions may span the air space and water penetration to the interior may occur.

To the greatest extent possible, mortar droppings should be prevented from falling into the air space or cavity. An aid to prevent this is to bevel the bed joint away from the air space or cavity, as shown in [Figure 6](#). When brick are laid on a beveled bed joint, a minimum of mortar is squeezed out of the joint, as shown in [Photo 7](#). The mortar squeezed from the joints on the air space or cavity side may be troweled onto the units. This same procedure may be used for laying the exterior wythes of grouted and reinforced brick cavity walls.

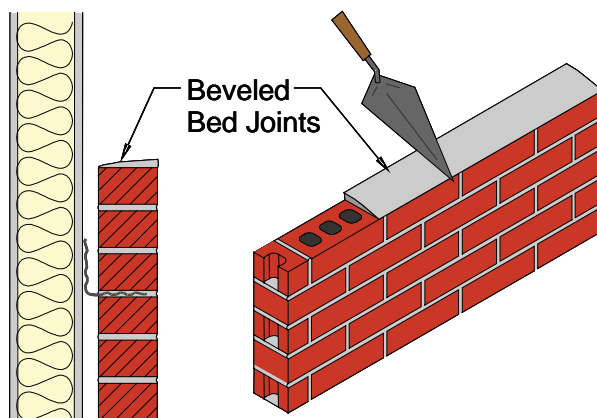


Figure 6
Beveled Bed Joints

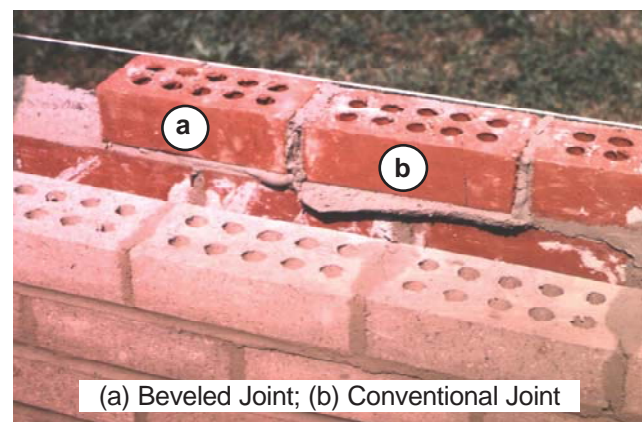


Photo 7
Beveled and Conventional Mortar Joints

Another method allows access to the base of the cavity for cleaning. When the brickwork is initially constructed, every third brick or so in the course above the flashing of the exterior wythe is omitted. Once the brickwork is complete, mortar droppings at the base of the cavity can be easily removed and weeps provided when the omitted brick are placed in the wall with mortar.

Alternately, a wooden or metal strip, slightly smaller than the cavity width, can be placed in the air space. This strip rests on the wall ties as the wall is built. Wire or rope is attached to the strip so the strip can be lifted out as the mason builds the wall. Care should be taken when raising or removing the strip to not disturb the brickwork.

Drainage materials and mortar dropping control devices may also be used to keep the air space adjacent to the weeps free from mortar. Use of these devices does not guarantee that bridging of the air space will not occur, thus the amount of mortar droppings should be limited as much as possible.

Disturbance of Newly Laid Masonry

Newly laid brick should never be pushed, shoved, tapped or otherwise disturbed once they are laid in their final position and the mortar has begun to set. Any disturbance at this point will break the bond and may lead to a leak. If adjustments are necessary, the incorrectly placed brick should be removed and re-laid in fresh mortar.

Protection of Unfinished Brickwork

Covering of masonry walls at the end of each work day, and especially in times of inclement weather, is essential for satisfactory performance. Covering unfinished walls with tarpaulins or other water-resistant materials, securely tied or weighted in position, should be rigorously enforced. Mortar boards, scaffold planks and light plastic sheets weighted with brick should not be accepted as suitable cover. Metal clamps, similar to bicycle clips, are commercially available in a variety of sizes to meet various wall thicknesses. These are used in conjunction with plastic sheets or water-repellent tarpaulins and offer excellent protection for extended periods of time.

Tops of walls should also be covered after the mason's work is finished if a permanent coping is not attached immediately after the brickwork is completed. Protection of openings in brickwork such as those for windows, movement joints, etc. should also be considered as they may allow moisture ingress from rain and snow and can lead to moisture-related problems such as efflorescence, and in some cases could affect the final mortar color.

SUMMARY

Quality construction practices and good workmanship are essential to achieve brickwork that is resistant to water penetration. This *Technical Note* does not cover all construction practices, but describes material storage and preparation procedures, construction practices and installation techniques that are indicative of high quality and, when combined with proper design, detailing and materials, result in brickwork that is resistant to water penetration.

The information and suggestions contained in this Technical Note are based on the available data and the combined experience of engineering staff and members of the Brick Industry Association. The information contained herein must be used in conjunction with good technical judgment and a basic understanding of the properties of brick masonry. Final decisions on the use of the information contained in this Technical Note are not within the purview of the Brick Industry Association and must rest with the project architect, engineer and owner.

REFERENCES

1. *The BDA Guide to Successful Brickwork*, Second Edition, The Brick Development Association, Arnold (a member of the Hodder Headline Group), London, England, 2000.
2. Drysdale, R.G., Hamid, A.A., and Baker, L.R., *Masonry Structures: Behavior and Design*, Second Edition, The Masonry Society, Boulder, CO, 1999.
3. Koski, J.A., "Waterproof the Backup Wythe," *Masonry Construction*, August 1992.
4. *Specification for Masonry Structures*, ACI 530.1-05/ASCE 6-05/TMS 602-05, The Masonry Society, Boulder, CO, 2005.

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

SECTION INCLUDES

- A. Structural steel columns, beams, lintels, trusses, rod bracing, and other steel framing members.
- B. Base plates, column anchor bolts,
- C. Steel to steel connection bolts.

REFERENCES

- A. ASTM A36, A992 –Structural Steel.
- B. ASTM A53 – Grade B Hot-Dipped, Zinc-coated Welded and Seamless Steel Pipe.
- C. ASTM A108 - Steel Bars, Carbon, Cold-Finished, Standard Quality.
- D. ASTM A123 - Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products.
- E. ASTM A153 - Zinc Coating (Hot Dip) on Iron and Steel Hardware.
- F. ASTM A307 - Carbon Steel Externally Threaded Standard Fasteners.
- G. ASTM A325 - High Strength Bolts for Structural Steel Joints.
- H. ASTM A490 - Quenched and Tempered Alloy Steel Bolts for Structural Steel Joints.
- I. ASTM A500 – Grade B Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Rectangular Shapes.
- J. ASTM A501 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- K. ASTM A572 - High Strength Low Alloy Columbium-Vanadium Steel of Structural Quality.
- L. ASTM F1554 – Anchor Rods
- M. AWS A2.0 - Standard Welding Symbols.
- N. AWS D1.1 - Structural Welding Code.
- O. AISC - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings – Allowable Stress Design..
- P. AISC - Specification for Architectural Exposed Structural Steel.
- Q. SSPC - Steel Structures Painting Council.

SUBMITTALS

- A. Shop Drawings:

1. Indicate dimensions, elevations, profiles, sizes, spacing, and locations of structural members, miscellaneous members, attachments, and fasteners.
 2. Connections detailed fully.
 3. Indicate welded connections with AWS A2.0 welding symbols. Indicate net weld lengths and returns.
 4. All truss connections shall be fully welded all around. All truss members shall be fully closed so as not to allow moisture to collect inside.
- B. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.
- C. Mill Test Reports: Submit indicating structural strength, destructive and non-destructive test analysis.
- D. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

QUALITY ASSURANCE

- A. Fabricate structural steel members in accordance with AISC - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
- B. Perform Exposed Work in accordance with AISC - Specification for Architectural Exposed Structural Steel.

QUALIFICATIONS

- A. Fabricator: Company specializing in performing the work of this Section with minimum five years documented experience.
- B. Design connections not detailed on the Drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of North Carolina.

FIELD MEASUREMENTS

- A. Verify that field measurements are as shown on Drawings.

PART 2 PRODUCTS

MATERIALS

- A. Structural Steel Wide Flange Members: Certified to ASTM A992 (Fy = 50 ksi).
- B. Plates, Angles, Bars: Certified to ASTM A36 (Fy = 36 ksi)
- C. Rods: to ASTM A36 (Fy = 36 ksi)
- D. Structural Tubing: ASTM A500, Grade B (Fy = 46 ksi).
- E. Pipe: ASTM A53, Grade B (Fy = 35 ksi).
- F. Bolts, Nuts, and Washers: ASTM A325.

- G. Anchor Rods: ASTM A1554 Grade 36.
- H. Welding Materials: AWS D1.1; type required for materials being welded.
- I. Headed Shear Studs: ASTM A108 Type B, Fu = 60 ksi.
- J. Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing a minimum compressive strength of 7000 psi at 7 days.
- K. Shop Applied Primer - Epoxy Finished Members: One coat of green solvent based inorganic zinc. Shop primer shall be certified to be compatible with the intumescent fireproofing and UL assemblies, and with epoxy systems as applicable and specified. Reference Section 09900.
- L. Shop Applied Primer – Exposed and Intumescent Fireproofed Members: One coat of grey oxide alkyd. Shop primer shall be certified to be compatible with the intumescent fireproofing and UL assemblies, as applicable and specified. Reference Section 09900.
- M. Shop Applied Primer – Cementitious Spray-on Fireproofed Members: Not required to be primed. Shop primer shall be certified to be compatible with the fireproofing UL assemblies.

FINISH

- A. Prepare structural component surfaces required to be shop primed in accordance with SSPC SP-2, SP-3 or SP-6 as applicable for the final finish type. Reference Section 09900.
- B. Shop priming is required for all exposed to view structural steel members. Shop priming not required for structural steel members where steel is to be enclosed and concealed from view in walls and ceilings or encased in concrete or masonry. Shop primer shall be certified to be compatible with the intumescent fireproofing and epoxy systems and applicable UL assemblies. Apply sufficient primer to insure required dry film thicknesses specified. Reference Section 09900.
 - 1. Members finished with epoxy systems: 2-3 mils DFT, SP-6 surface preparation
 - 2. Members finished with alkyd systems: 2 mils DFT, SP-2 or SP-3 surface preparation
- C. Members to receive cementitious spray-on fireproofing are not required to be primed. Shop primer shall be certified to be compatible with the fireproofing UL assemblies.
- D. Top flanges of beams receiving headed shear studs embedded within concrete shall not be primed.
- E. Lintels in exterior walls shall be hot dip galvanized to G60 standards, after fabrication. All seams in built-up members to be hot dip galvanized such as beam and plate lintels shall be seal welded.

PART 3 EXECUTION

EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Verify that lay down areas are sufficient, clean, level, and of sufficient strength and stability to support safely members and handling equipment.

HANDLING AND STORAGE

- A. Provide proper equipment too safely off load material to prevent damage.
- B. Provide adequate dunnage and skids to keep steel from getting muddy and dirty.
- C. Store steel in such a manner to prevent the accumulation of water and debris.
- D. Do not erect steel that is muddy or stained with any deleterious material. Clean steel if necessary before erection.

ERECTION

- A Allow for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- B. Do not field cut or alter structural members without approval of Architect/Engineer.
- C. After erection, clean and prime paint welds, abrasions, and surfaces where shop primer has been disturbed, deteriorated or damaged.
- D. All eaves shall be aligned to be straight and true. All joist extended ends at the eaves and all HSS outriggers at the gables shall be pulled into alignment and securely welded to the continuous edge plate or angle as applicable. Edge plates and angles shall be string lined for straightness.
- E. Gable outriggers shall be accurately laid out to fit under the wide flute of the metal deck and shall be welded to the top of the affected joists. The metal deck shall be puddle welded to the top of the HSS outriggers at 12" o.c. in addition to welding to the supporting joists.
- F. The bent plate ridge plate shall be aligned vertically and horizontally and shall be securely welded to the ends of the joist extended ends to form straight and level ridge.
- G. The continuous eave bent plates and gable edge angles shall be butt welded straight and full strength at joints. Provide a break in the continuous bent plate and angle members over supports at maximum 40 foot intervals. The minimum length of these members shall be 20 feet. These break joints shall be over a support and shall be welded thereto.
- H. Grout under column base plates to get full uniform bearing.

FIELD QUALITY CONTROL

- A Field inspection will be performed by the Architect.
- B. All connection bolts and field welds shall be inspected by an independent testing lab selected by the owner and paid by the contractor from the material testing allowance.
- C. All steel beam to beam, beam to column, brace connections, and joist girder to column. Joists to joist girder, and joists to column connection bolts shall be tightened to a snug tight condition.
- D. Shop welds and fabrication quality shall be certified by the materials testing laboratory. At the option of the lab the inspection may be conducted in the field after delivery or at the fabrication plant during fabrication and/or prior to shipment.
- E. All structural steel members shall be inspected by the testing laboratory for sweep, camber, and twist to comply with ASTM A6 and AISC Code of Standard Practice for fabricated structural steel. Types of weld tests and frequency of tests shall comply with AWS D1.1 - Structural Welding Code, 2006 Edition.

- F. All out of tolerance members shall be corrected prior to erection by the contractor.
- G. All connections with misfitting bolts shall be field welded as directed by the inspector to fully compensate for the strength of the misfitting bolts.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

SECTION INCLUDES

- A. Open web steel joists, joist girders, with bridging, extended ends, bolted bridging bolts, and other joist accessories.

REFERENCES

- A. ASTM A36/A36M, A992 - Structural Steel.
- B. ASTM A500 – Grade B
- C. ASTM A242/242M - High Strength Low Alloy Structural Steel.
- D. ASTM A529/529M Grade 50 - High Strength Carbon-Manganese Steel of Structural Quality.
- E. ASTM A572/572M Grade 50 - High Strength Low Alloy Columbian-Vanadium Steel of Structural Quality.
- F. ASTM A588/588M - High Strength Low Alloy with 50 kis Minimum Yield Point to 4 inches thick.
- G. ASTM A606 - Steel Sheet and Strip, Hot Rolled and Cold Rolled High-Strength Low Alloy, with Improved Corrosion Resistance.
- H. ASTM A1011/A1011M - Steel, Sheet and Strip Hot Rolled, Carbon, Structural High Strength Low-Alloy and High Strength Low Alloy with Improved Formability.
- I. ASTM A1008/A1008M - Steel, Sheet Cold Rolled, Carbon, Structural High Strength Low-Alloy and High Strength Low Alloy with Improved Formability.
- J. ASTM A108 - Steel Bars, Carbon, Cold-Finished, Standard Quality.
- K. ASTM A307 - Carbon Steel Threaded Standard Fasteners.
- L. ASTM A325 - High Strength Bolts for Structural Steel Joints.
- M. ASTM A53 – Grade B
- N. AWS D1.1 - Structural Welding Code.
- O. FM - Roof Assembly Classifications.
- P. SJI (Steel Joist Institute) - Specifications, Load tables, and Weight Tables for Steel Joists and Joist Girders.
- Q. SSPC (Steel Structures Painting Council) - Steel Structures Painting Manual.
- R. UL - Fire Resistance Directory.
- W. Warnock Hersey - Certification Listings.

SUBMITTALS FOR REVIEW

- A. Shop Drawings and Erection Plans and Diagrams:
 - 1. Indicate standard designations, configuration, sizes, spacing, locations of joists, joist girders, trusses, top and bottom chord extensions, bolted connections, welded connections.
 - 2. Coding of bridging, connections, attachments, and accessories for complete installation.
 - 3. Cambers in adjacent members shall be uniformly controlled to be no greater than required by SJI standards.

SUBMITTALS FOR INFORMATION

- A. Welders' Certificates: Submit manufacturer's certificates, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

QUALITY ASSURANCE

- A. Perform Work in accordance with SJI, Load Tables, and Weight Tables.
- B. Maintain one copy of each shop drawing document on site.
- C. Fabricator: Company specializing in performing the work of this section with minimum five years experience.
- D. Erector: Company specializing in performing the work of this section with minimum five years experience.
- E. Joists and Joist Girders and their connections not detailed on the Drawings shall be designed by Professional Engineer experienced in design of this work and licensed in the State of North Carolina and employed by the joist supplier.

DELIVERY, STORAGE, AND PROTECTION

- A. Material and Equipment: Transport, handle, store, and protect products to SJI requirements so as not to damage, bend or otherwise distort members from their fabrication conditions.

PART 2 PRODUCTS

MATERIALS

- A. Open Web Joists Members: SJI Type K, KCS, LH Longspan, G series Joist Girders.
- B. Bolts, Nuts and Washers: ASTM A325.
- C. Structural Steel For Supplementary Framing, Joist Extensions, and Joists Substitutes.
- D. Welding Materials: AWS D1.1; type required for materials being welded.
- E. Shop and Touch-Up Primer:
 - 1. SSPC 15, Type 1, grey oxide alkyd for joists permanently exposed to view. Reference 09900.
 - 2. Joists permanently concealed may not receive shop primer at contractor's option.
 - 3. Joists to receive cementitious spray-on fireproofing do not require primer. Primer if used shall be certified to compatible with fireproofing UL assemblies.

FABRICATION

- A. Provide bottom and top chord extensions as indicated. Top chord extensions shall be continuous smooth straight extensions of the joist top chord without bends or sweeps.
- B. Fabricate to achieve minimum end bearing of 2-1/2 inches on steel for K series, 5" for LH series, 6" for G series joist girders. Refer to drawings for additional bearing requirements for sloping joists and joist girders.
- C. Provide for 3/4" diameter A325 connection bolts for joist to joist girder, and joist to column, and joist to beam connections. Provide field welded connections for all field bolted connections after adjustment and plumbing of the structural frame.
- D. Provide 1/2" ASTM A307 bolts for all field bolted diagonal bridging requirements.
- E. Drill or punch not burn holes in girder chords and flanges and column cap plates necessary for attachment of bolted joists.

FINISH

- A. Prepare joist component surfaces to receive shop primer in accordance with SJI standards.
- 4. B. Shop prime joists that are to be exposed to view. Joists to receive cementitious spray-on fireproofing do not require primer. Primer if used shall be certified to compatible with fireproofing UL assemblies.

SOURCE QUALITY CONTROL AND TESTS

- A. Provide shop testing in accordance with SJI standards.

PART 3 EXECUTION

EXAMINATION

- A. Coordination: Verification of existing conditions prior to beginning fabrication work.
- B. Production prior to approval of shop drawings shall be at contractor's risk.

ERECTION

- A. Erect and connect joists to supports.
- B. Allow for erection loads. Provide sufficient temporary bracing to maintain framing safe, plumb, and in true alignment. Strictly follow all OSHA regulations for job safety.
- C. Install, field weld and/or bolt joist seats to supports as erection progresses.
- D. Position and field weld joist bottom chord extensions as erection progresses.
- E. Frame roof openings greater than 12 x 12 inches with supplementary framing.
- F. Do not permit erection of decking until completion of installation of permanent bridging and bracing.
- G. Do not field cut or alter structural members without approval of joist manufacturer.

- H. All joist top chord extensions at ridges and eaves shall be brought into close alignment and securely field welded to the continuous ridge and eave angles or plates to give true and straight line to ridges and eaves.
- I. After erection, prime welds, abrasions on shop primed joists.

ERECTION TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch.
- B. Maximum Offset From True Alignment: 1/4 inch.

FIELD QUALITY CONTROL

- A. Field inspection will be performed by the Architect. Additional inspection of materials and connections shall be performed by an independent testing laboratory at the direction of the Architect. Payment for the testing laboratory services will be paid by the contractor out of the testing allowance.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART I: GENERAL

SECTION INCLUDES

- A. Steel roof deck and accessories.
- B. Formed steel ridge strips, eave strips, valley strips, fasteners, and sound attenuation strips for acoustical deck flute filler.

REFERENCES

- A. ASTM A36/A36M — Structural Steel.
- B. ASTM A1008/A1008M — Primed Sheet Steel, Cold—Rolled Sheet, Carbon, Structural Quality with minimum yield strength of 33 ksi.
- C. ASTM A653/A653M — Galvanized Sheet Steel, Cold—Rolled Sheet, Carbon, Structural Quality with minimum yield strength of 33 ksi.
- D. AWS D1.1 — Structural Welding Code.
- E. FM — Roof Assembly Classifications.
- F. SDI (Steel Deck Institute) — Design Manual for Composite Decks, Form Decks, Roof Decks, Cellular Metal Floor Deck with Electrical Distribution.
- G. SSPC (Steel Structures Painting Council) — Painting Manual.
- H. UL — Fire Resistance Directory.
- I. Warnock Hersey — Certification Listings.

PERFORMANCE REQUIREMENTS

- A. Design metal deck in accordance with SDI Design Manual.
- B. Deck units shall be laid out in a minimum three span condition.

SUBMITTALS FOR REVIEW

- A. Shop Drawings: Indicate deck plan, support locations, projections, openings, pertinent details, fastening patterns, and accessories with fastening patterns.
- B. Product Data: Provide deck profile characteristics and dimensions, structural properties, finishes, and fasteners for side laps.

SUBMITTALS FOR INFORMATION

- A. Certificates: Certify that Products meet or exceed specified requirements.
- B. Submit manufacturer's installation instructions.

- C. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

QUALITY ASSURANCE

- A. Manufacturer: Company specializing furnishing material under this specification for a minimum of five years.
- B. Installer: Company specializing in performing the work of this Section with minimum five years experience.
- C. Design deck layout, spans, fastening, joints, under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of North Carolina.

DELIVERY, STORAGE, AND HANDLING

- A. Material and Equipment: Transport, handle, store, and protect products from damage.
- B. Cut plastic wrap to encourage ventilation.
- C. Store deck and accessories on dry wood sleepers; slope for positive drainage.
- D. Store acoustical metal deck indoors to prevent rusting of the punched deck flutes. Store sound attenuation strips when required in sealed packages indoors out of the weather.

PART 2 PRODUCTS

MATERIALS

- A. Manufacturers:
 - 1. Vulcraft 1 ½" deep type 1.5 B, 22 gage with 36" cover. Vulcraft 3" deep type N, 22 gage with 24" cover. Regular and Acoustical Deck units.
 - 2. Wheeling 1 ½" type B, 22 gage with 36" cover. Wheeling 3" deep type N, 22 gage with 24" cover. Regular and Acoustical Deck units.
 - 3. United Steel Deck 1 ½" type B, 22 gage with 36" cover. United 3" deep type N, 22 gage with 24" cover. Regular and Acoustical Deck units.
- B. Sheet Coating: 1 ½" type B regular and 3" type N shall be primed. Roof deck primer where cementitious spray-on fireproofing will be applied shall be certified to be compatible with the fireproofing and UL assemblies.
- C. Sheet Steel: ASTM A653/653M, A1008/A1008M with minimum yield strength 33 ksi.
- D. Welding Materials: AWS D1.1.
- E. Shop and Touch Up Primer: SSPC 15, Type 1, grey oxide for primed deck, certified as compatible with the fireproofing and UL assemblies.

ACCESSORIES

- A. Ridge Strips, Valley Strips, Eave Strips, sound attenuation strips for acoustical deck flute fills: Fabricated of metal of same type, gage and finish as deck.

PART 3 EXECUTION

EXAMINATION

- A. Coordination: Verification of existing conditions prior to beginning work.
- B. Fabrication prior to approval of shop drawings shall be entirely at the risk of the contractor.

INSTALLATION

- A. Erect metal deck in accordance with SDI Manual and manufacturer's instructions. Deck units shall be erected in a minimum three span condition unless otherwise noted on drawings.
- B. Bear deck on steel supports with 2 1/2 inch minimum bearing. Align deck units in true straight lines. Allow for minimum 3" end laps.
- C. Fasten deck to steel support members at ends and intermediate supports with 3/4" diameter fusion puddle welds at 12 inches oc maximum. Weld spacing shall be enhanced to 6" centers within 12 feet of ridges, gable ends, and eaves.
- D. Weld in accordance with AWS D1.1.
- E. Mechanically fasten side laps at 24 inches oc maximum with #12 tek screws.
- F. Place formed steel ridge strips, eave strips, valley strips in position and mechanically attach at 6" oc.
- G. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch up zinc rich prime paint.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

DESCRIPTION OF WORK:

Work of this Section shall consist of all labor and materials required to provide all miscellaneous fabricated metal items scheduled on Drawings and specified in this Section.

Miscellaneous metal items for which drawing information is fully descriptive are not necessarily named herein, but shall be provided as shown and as required.

INDUSTRY STANDARDS:

For listing of names of industry standard agencies mentioned by abbreviation in this Section refer to Section 01068.

QUALITY ASSURANCE:

Manufacturers:

Standard: For purposes of designating type and quality for work under this Section, Drawings and Specifications are based on products manufactured or furnished by Manufacturers listed for each item.

SUBMITTALS:

Shop Drawings: Submit shop drawings in quadruplicate to Architect in accordance with GENERAL CONDITIONS for approval of all fabricated miscellaneous items. Shop drawings shall indicate following: fabrication, assembly and erection details, sizes of all members, fastenings, supports, and anchors; patterns; clearances, and all necessary connection to work of other trades.

Catalog Cuts: For standard manufactured items, catalog cuts may be submitted as specified in GENERAL CONDITIONS, providing all technical performance characteristics and other pertinent information are given.

PRODUCT HANDLING:

Handling and Storage: Handle all materials carefully to prevent damage and store at site above ground in covered, dry locations.

Replacement: Damaged items that cannot be restored to like-new conditions shall be removed and replaced at no additional cost to Owner.

PART 2: PRODUCTS

BASIC MATERIALS:

Structural Shapes: ASTM A 36/A572 Dual Certified.

Steel Pipes: ASTM A 72 welded wrought iron pipe, standard weight, Schedule 40.

Steel Tubing: ASTM A 500, Grade B.

Cast Iron: ASTM A 48j, Class 30, with minimum tensile strength of 30,000 psi.

Zinc-coated iron or Steel Sheets: ASTM A 446.

Cold-rolled Carbon Steel Sheets: ASTM A 366-66.

Exterior Lintels: ASTM A123 - Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products

Stainless Steel Sheet: Type #304

FABRICATION:

Measurements: Verify all measurements and take all field measurements necessary before fabrication.

Fasteners: Exposed fastenings shall be compatible materials, shall generally match in color and finish, and shall harmonize with material to which fastenings are applied. Permanent connections shall be riveted, welded or bolted. Exposed welds shall be ground smooth and flush.

Components: Include materials and parts necessary to complete each item properly, even though such work may not definitely be shown or specified.

Provide and install miscellaneous bolts and anchors, supports, braces, and connections necessary for completion of work.

Drill or punch holes for bolts and screws. Poor matching of holes will be rejected. Conceal fastenings where practicable.

Painting and Protective Coating:

All ferrous metal, except stainless steel and galvanized surfaces, shall be properly cleaned and given one shop coat of red lead or zinc chromate primer.

Anchors built into masonry shall be coated with asphalt paint unless specified to be galvanized. Metal work to be encased in concrete shall be left unpainted unless specified or noted otherwise.

Where hot-dip galvanized or zinc-coated metal is specified or shown, it shall not be shop-primed unless specifically required otherwise for paint finish, which shall require bonderized or paint-grip primer. Recoat at all field welds and grindings, and where initial galvanized coating has been removed or deteriorated..

Galvanizing:

Hot-dip galvanizing or zinc coatings applied on products fabricated from rolled, pressed and forged steel shapes, plates, bars and strips shall comply with ASTM A 123-68.

Lintels in exterior walls shall be hot dip galvanized to ASTM A123 G60 standards after fabrication.

Exterior handrails shall be hot dip galvanized to ASTM A123 G60 standards after fabrication.

MISCELLANEOUS ITEMS:

Supplementary Structural Steel: All structural framing incorporated in building design and detailed on Architectural Drawings, but not shown on Structural Steel Drawings, shall be furnished as part of miscellaneous metal work.

Miscellaneous Lintels, Shelf Angles, Beams and Plates, Brackets: Provide miscellaneous lintels and shelf angles, beams, plates, and brackets as indicated.

Lintels shall have 8" bearings at each end unless shown otherwise.

Weld or bolt members together where so indicated, to form complete composite assembly. Set beams on plates as indicated.

Where shelf angles are attached to concrete with bolts and adjustable inserts, provide slotted holes of proper size and spacing in vertical leg of shelf angles.

Miscellaneous Fasteners: Furnish all bolts, nuts, anchor bolts, plates, anchors, ties, clamps, hangers, nails, spikes, screws, straps, toggle and expansion bolts, and other items of rough hardware of sufficient size and number to tie together various parts of building and secure all of its parts in place. Such miscellaneous items shall be of same material as metals they contact.

Supports, Bracing:

Furnish and install all bracing and suspension type supports, fastened to structure, for following and additional conditions, as may be required.

1. Exterior soffits
2. Head of exterior doors and window wall

Handrails: Provide pipe handrails as detailed, fabricated from 1-1/2 I.D. pipe. Weld all joints and grind smooth. Fabricate entire assembly carefully in accordance with details. After installation, use wire brush, sand blast, or otherwise treat to provide completely smooth surface for application of paint. Wall handrail consist of straight sections of black steel pipe, mounted on wall brackets. Install brackets with approved anchoring device. Close ends with molded end closures.

All exterior handrails shall be hot dipped galvanized, exposed not requiring finish painting. All welds and grindings to be recoated on site with a field applied galvanizing coating to match.

Ladders: Where indicated vertical wall mounted interior ladders shall be 20" wide, fabricated with 3/8"x 1-1/2" hot-rolled rails and 3/4" round steel rungs extending through rails with connection welds, provided at all roof hatch locations. Space rungs 12" o.c. Anchor ladders at bottom and top. Brackets shall be of same size as side rails and of such length as to hold ladder 7" away from wall.

PART 3: EXECUTION

WORKMANSHIP:

Ferrous metal surfaces shall be clean and free from mill scale, flake rust and rust pitting; well formed and finished to shape and size, with sharp lines and angles and smooth surfaces.

Castings shall be of uniform quality, free from blow-holes, porosity, hard spots, shrinkage distortion or other defects. Castings shall be smooth and well cleaned by shot-blasting or other approved method. Covers subject to street or foot traffic shall have machined horizontal bearing surfaces. Provide machined bearing or contact surfaces for other joints where indicated or required.

COORDINATION: At proper time, deliver and set in place items of metal work to be built into adjoining construction.

PAINTING: Finish painting of items not factory painted shall be as specified in Section 09900.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

DESCRIPTION OF WORK:

Work of this Section shall be to provide expansion control joint covers as shown on Drawings and specified in this Section.

Building expansion joints with joint covers specified (walls, floors and ceilings) are required at all locations where enclosed connectors meet building units.

INDUSTRY STANDARDS:

For listing of names of industry standard agencies mentioned by abbreviation in this Section, refer to Section 01068.

QUALITY ASSURANCE:

Manufacturers:

Standard: For purpose of designating type and quality for work under this Section, Drawings and Specifications are based on products manufactured by the C/S Group Company. Other Manufacturers who can furnish products or systems of same materials specified and equal in all respects will also be acceptable, such as Architectural Art Mfg., Balco, Inc., and M M Systems.

SUBMITTALS:

Manufacturer's Data: Submit three (3) copies of folder containing complete Manufacturer's data and installation procedures for all products to be used in work of this Section.

Shop Drawings: Submit Shop Drawings in compliance with GENERAL CONDITIONS. These drawings shall be coordinated with adjacent work.

PRODUCT HANDLING:

Working Areas: Provide suitable areas for storage of materials and equipment.

Delivery: Deliver products to site in original sealed containers or packages bearing Manufacturer's name and brand designation.

PART 2: PRODUCTS

FLOOR JOINT COVERS: Balco, Inc. Model 75FPE-1. Coordinate with finish floor material. Floor to floor units to be complete with extruded aluminum frames, center plates and cover plates extruded from 6063T5 alloy. Frames to be anchored to slab with 1/4" (6.25 mm) diameter expansion bolt anchors. Flexible vinyl expansion filler. Floor joints to be coordinated to provide alignment with wall and ceiling expansion joint covers. All aluminum surfaces in contact with masonry shall receive a shop coat of zinc chromate primer.

WALL JOINT COVERS: C/S Group Model AFW Series. Extruded aluminum cover plates and snap-lock anchor clips to be 6063-T52 alloy. Cover plate to be supplied with continuous duroflex seal. Snap-lock anchor shall be secured 24" O.C., complete with serrations to assure positive adjustable anchorage. Finish shall be satin clear anodize, prime coat for field painting, Medium , dark Bronze or Kynar 500 colors, to be selected by Architect to suit condition of use.

CEILING JOINT COVERS: C/S GROUP MODEL FC OR FCFC Series. Cover shall be aluminum and dual durometer P.V.C. The vertical legs shall be a rigid material for positive anchoring. The exposed gaskets shall be a flexible P.V.C. to allow for expansion and contraction of the joint cover. Color to be white.

Provide joint covers at all areas abutting existing building.

PART 3: EXECUTION

INSPECTION

Examine all surfaces to which products are scheduled to be installed. If unsatisfactory conditions exist, report to General Contractor and do not proceed with work until conditions have been satisfactorily corrected.

INSTALLATION

Install expansion joint covers at locations indicated on Architectural and / or Structural Drawings and at all locations where enclosed connectors meet building units, in accordance with Manufacturer's printed instructions and Shop Drawings, approved by Architect.

All installations shall be performed by capable workmen under direction of foreman fully qualified by experience in each respective field of installation work.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

DESCRIPTION OF WORK:

Work of this Section shall consist of all labor and materials required to provide all rough carpentry work scheduled on Drawings and specified herein.

INDUSTRY STANDARDS:

For listing of names of industry standard agencies mentioned by abbreviation in this section refer to Section 01068.

CODE COMPLIANCE:

All framing to comply with the current edition of the Building Code having jurisdiction in North Carolina.

QUALITY ASSURANCE:

Manufacturers:

Standard: For purposes of designating type and quality of work under this Section, drawings and Specifications are based on products manufactured or furnished by Manufacturer listed for each product.

COORDINATION WITH OTHER TRADES: Coordinate locating of nailers, furring, grounds, and similar supports for other trades so that installation of finish work may be properly executed to fulfill design requirements.

MOISTURE CONTENT OF LUMBER: Maximum moisture content for lumber products shall be 19 percent on air dried stock, and 15 percent maximum on kiln-dried (KD) stock.

DRESSED LUMBER: Surface lumber four sides (S4S) unless specified otherwise for particular products.

DELIVERY AND STORAGE: As soon as materials are delivered to site, place under cover and protect properly from weather. Do not store or erect material in wet or damp portions of buildings or in areas where plastering or similar work is to be executed until such work has been completed and has become reasonably dry.

PART 2: PRODUCTS

FRAMING LUMBER

Various materials for framing shall be of sizes shown and shall conform to Grading Standards of SPIB. All framing material shall be #2 SYP.

Where indicated on the Drawings, provide FRT Fire Retardant Treated lumber.

PLYWOOD or ORIENTED STRAND BOARD MATERIALS: Softwood plywood or OSB sheathing shall conform to requirements of U. S. Product Standard PS 1-66, Construction and Industrial. All plywood or

OSB sheathing which has any edge or surface permanently exposed to weather shall be "EXTERIOR" type.

Where indicated on the Drawings, provide FRT Fire Retardant Treated plywood.

Where indicated on the Drawings, provide PT Preservative Treated plywood.

PRESERVATIVE TREATED WOOD PRODUCTS: Protective pressure treatment of lumber or products shall be .40 pcf retention of chromated copper arsenate as produced by Wolman, Osmose, Boliden or approved equal. Material shall be treatment grade marked, for ground contact, kiln dried not to exceed 19%, and all cut ends shall be coated with the same preservative, at job site during construction.

All lumber products in contact or fastened to concrete, concrete masonry or brick masonry to be preservative treated wood products.

FASTENING DEVICES: Anchors and fasteners for securing wood items, unless noted otherwise, shall meet following requirements:

Bolts:

- Bolts, nuts, studs and rivets shall conform to Federal Specifications FF-B-571a and FF-B-575, as applicable.
- Lag screws or lag bolts: Federal Specification FF-B-561b.
- Toggle Bolts: Federal Specification FF-B-588b.
- Screws: Federal Specification FF-S-111b.
- Nails and Staples: Federal Specification FF-N-105a.

All fastening devices used in exterior or concrete construction shall be hot-dip galvanized.

All fastening devices used in Fire Retardant Treated or Preservative Treated lumber and plywood to be corrosion resistant per manufacturer's recommendations.

Ground Anchorage: Wood plugs or nailing blocks are not acceptable for fastening grounds, furring, or blocking to concrete or masonry. Hardened steel nails, expansion screws, toggle-bolts, metal plugs, or metal inserts, as most appropriate for each type of masonry or concrete construction shall be used.

Explosive-Driven Fastenings: Explosive or powder-driven fastenings may be used only when approved by Architect.

PART 3: EXECUTION

GENERAL REQUIREMENTS FOR FRAMING AND BRACING:

Finish: Unless otherwise indicated, use S4S lumber for all framing members.

Size: Unless otherwise indicated, framing shall conform to nominal size requirements shown on Drawings.

Space framing on 16 inch centers, unless shown otherwise on Drawings.

Install required blocking, bracing, or other framing required for support of built-in equipment, including casework.

INSTALLATION OF WOOD GROUNDS:

Location: Install permanent and temporary wood grounds as indicated for proper execution of work of all trades. Remove temporary grounds when no longer required.

Fastening: Except as otherwise required for special locations, form grounds of kiln-dried southern yellow pine, 1-1/2 inches wide, and of thickness to properly align related items of work. Securely fasten grounds into position by means of nails, brads, bolts, or other methods that will provide maximum results.

Coordination: Coordinate locations, sizes and fastenings of grounds with work of other trades. When grounds are to provide backing for fastening of grilles, fixtures, louvers, and similar items of work, exercise care in installation of grounds to provide for correct installation of those other items of work.

INSTALLATION OF WOOD BLOCKING:

Location: Install all wood blocking required to provide anchorage for other materials. Form to shapes and sizes as indicated or as may be required to accomplish particular installation. Form blocking of sizes shown or of minimum 2 inch thick nominal material.

At location of wall mounted equipment install 2"x 8" blocking unit between properly located studs at height indicated in Finish Hardware Schedule, or where indicated for wall mounted equipment. Install wood blocking behind all cabinets and toilet accessories as required.

Steel: Blocking in conjunction with steel work shall be bolted to steel with bolts, washers and nuts, countersunk where required.

Roofing: Form blocking in conjunction with gravel stops and built-up roofs to shapes as detailed. Anchor with countersunk bolts, washers and nuts.

Anchorage: Wedge, anchor and align blocking to provide rigid and secure installation of both blocking and other related work.

INSTALLATION OF WOOD FURRING:

Location: Provide all free-standing, suspended, solid-anchored, and other types of wood furring as required for receipt, alignment and complete installation of various types of finishing materials.

Spacing: Space furring members as required. Provide headers and other nailing members within furring framework. Install with faces true to line and plumb, using wood shims as necessary.

Fastening: Install furring into position by whatever means required to provide secure, rigid, and correct installation. When necessary, use nailing plugs, power-actuated anchors, toggle bolts, anchor bolts, washers and nuts, nails, and similar fastenings.

CLEANING UP: At completion, remove all excess materials and all debris resultant from operations of work of this Section. Leave entire work in neat, clean condition, satisfactory for receipt of other related items of work to be installed as part of work of other Sections.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

DESCRIPTION OF WORK:

Work of this Section shall include furnishings all labor and materials required to provide all finish carpentry and millwork, as scheduled on Drawings and as specified herein.

Work Included This Section:

All finish carpentry, cabinetwork, and millwork, as identified on Drawings, which shall include, but not necessarily be limited to the following:

1. Cabinets (base and wall hung)
2. Interior wood trim and paneling.
3. Work Counters
4. Shelves and Slatwall
5. Hanging all wood doors as scheduled. Doors will be fabricated prefrit.

Furnish all millwork and cabinet work, deliver to building, assemble, level, secure to floors and/or walls, as shown on Drawings, equipment schedule, Specifications, and processed Shop Drawings.

INDUSTRY STANDARDS:

For listing of names of industry standard agencies mentioned by abbreviation in this section refer to Section 01068.

AWI Quality Standard: Comply with applicable requirements of "Architectural Woodwork Quality Standards" published by the Architectural Woodwork Institute (AWI), except as otherwise indicated.

QUALITY CONTROL:

Millwork Contractor shall be approved by Architect on basis of quality of work performed during at least 10 years of manufacturing, capability to meet requirements of these specifications, reputation of performing satisfactory work on time, and completion of at least three satisfactory installations of projects of comparable size.

SUBMITTALS:

Shop Drawings: Submit shop drawings in accordance with GENERAL CONDITIONS on all items fabricated for this Project. Shop Drawings shall locate all grounds, blocking, and other anchoring devices required to properly secure the work.

Do not fabricate millwork until final Shop Drawings have been processed by Architect. Reviewing and processing shop drawings by Architect does not relieve Contractor of checking and verifying job dimensions and conditions required by details on processed Shop Drawings and Contract Drawings.

Reviewing and processing shop drawings by Architect does authorize changes. No changes will be made without explicit written authorization.

Samples: Submit samples of following items for approval by Architect prior to preparation of Shop Drawings and deliver to Project Site.

- Cabinet door and drawer, showing constructions.
- Shelving Wood trim countertop and backsplash (plastic laminate clad)

PRODUCT HANDLING:

Delivery: Do not deliver millwork items to job site until building is sufficiently conditioned to prevent damage by moisture, dampness, excessive humidity, extreme dryness, extreme heat or cold.

Storage: Store millwork in enclosed areas having same temperature and humidity conditions as areas in which millwork will be installed.

Damaged Items: Remove from site immediately all items damaged due to improper handling or storage.

ENVIRONMENTAL CONDITIONS:

Building Conditions: Install millwork only when normal temperature and humidity conditions approximate interior conditions that will exist when building is occupied.

Glazing shall be in place, and all exterior openings closed. All concrete, plastering, and other wet work shall be completed and dry.

Heat and Ventilation shall be provided to maintain proper conditions before, during and after completion of installing casework.

PART 2: PRODUCTS

MATERIALS:

General: Except as otherwise indicated, comply with following requirements for architectural woodwork not specifically indicated as prefabricated or prefinished standard products.

Wood Moisture Content: Provide kiln-dried (KD) lumber with an average moisture content range of 9% to 13% for exterior work and 6% to 11% for interior work. Maintain temperature and relative humidity during fabrication, storage and finishing operations so that moisture content values for woodwork at time of installation do not exceed the following:

Interior Wood Finish: 8% - 11% for damp regions (as defined by AWI).

Interior Wood for Transparent Finish:

Solid Wood: Plain-sawn premium clear red oak.

Plywood: Plain sliced premium clear red oak.

Plastic Laminate: Comply with NEMA LD-3 for type (vertical and horizontal grades), thickness, color, pattern and finish indicated for each application, or if not indicated, as selected by Architect from manufacturer's standard products.

Provide Formica or equivalent Laboratory Grade Laminate 840/LGP over 45 lb. density industrial grade particleboard (CS 236-66: Type 1, Grade B, Class 2) where chemical resistant countertops are indicated, or in all science or vocational areas.

Provide exterior grade plywood or water resistant resin impregnated composition board countertops at all locations with a sink. Use CD exterior grade veneer plywood, fabricated with water resistant glues and adhesives.

Quality Standards: For following types of architectural woodwork; comply with indicated standards as applicable:

Casework and Countertops: AWI Section 400.

Shelving: AWI Section 600.

Design and Construction Features: Comply with details shown for profile and construction of architectural woodwork; and, where not otherwise shown, comply with applicable Quality Standards, with alternate details as Fabricator's option.

Solid Surface Countertops: Where Corian Solid Surface tops are indicated, provide ½" Corian or equal solid surfacing material. Architect to select from manufacturer's full range of colors and patterns.

Laminated Slatwall Paneling: 3/4 inch thick medium density fiberboard paneling, laminated with high pressure laminate, grooved to receive standard-sized fixture mounting brackets for display. Color to be selected from panel manufacturer's standard options. Grooves shall be lined with powder coated extruded aluminum inserts, color selected by Architect.

INTERIOR ARCHITECTURAL WOODWORK:

Wood Casework, Transparent Finish or Plastic Laminate Clad

AWI Section: 400

Grade: Custom

Construction: Reveal Overlay.

CABINET HARDWARE AND ACCESSORY MATERIALS:

Hardware Standards: Except as otherwise indicated, comply with ANSI A 156.9 "American National Standard for Cabinet Hardware". Millwork Contractor to provide slides, dual hinges, catches, standards, brackets, locks, and pulls as shown and required.

Coat Hooks: Provide double coat hooks on all Administration wood doors.

Drawer and Door Pulls: Hafele No. 151.33.203, cast aluminum, brushed aluminum finish.

Catches: Heavy-duty roller ball catches.

Hinges: Reveal overlay, 5-knuckle, non-removable pin, institutional hospital type, brushed nickel finish, by Terry or Rockford Process Control, or equivalent.

Edge Band: 3mm PVC unless indicated otherwise, exposed or concealed.

Unless otherwise noted, all casework edges (including but not limited to: doors, drawers, case body panels, wall cabinet body panels, countertops, backsplashes) shall be banded with 3mm PVC.

Shelving Edge Band: Provide 3mm PVC edgebanding of shelves on front and rear edges only, with 1mm PVC edgebanding on remaining two side edges.

Glass: Glass shall be Grade A, double strength, where scheduled.

Countertop Support Bracket: Wall mounted bracket, powder coated A-36 steel, 3/8" thick x 2.5" with beveled edges, with integral steel gusset. Mount with masonry expansion anchors at masonry support wall. Equivalent to model Front Mounting PLUS Brackets by Centerline Brackets.

Stainless steel sinks will be furnished and installed by Plumbing Contractor in countertop openings provided by Millwork Contractor.

PART 3: EXECUTION

INSPECTION OF SURFACES:

Inspection: Before installation begins, inspect all areas to receive work, as follows:

For any deficiency which might prevent satisfactory installation of cabinetwork, millwork, or hanging wood doors.

For presence and proper positioning of grounds and other anchoring devices built into work as required by approved millwork Shop Drawings.

Acceptance of Surfaces: Do not start work until deficiencies of surfaces to receive work have been corrected. Beginning of installation in any area shall constitute acceptance of that area as satisfactory to receive this work. Contractor shall be fully accountable for final results and workmanship specified herein.

INSTALLATION:

Cabinetwork:

Install all cabinetwork in place, level, plumb, and accurately scribed and secured to wall and/or floor, as shown on Shop Drawings approved by Architect.

Wall cabinets shall be fastened using 1/4" diameter lag bolts in lead shields @ 24" maximum spacing, minimum of 4 anchors per wall hung cabinet section, 2 anchors across top and 2 anchors across bottom.

Base cabinets shall be fastened using 1/4" diameter lag bolts in lead shields @ 24" maximum spacing, minimum of 4 anchors per cabinet section.

Installation shall be complete, including all trim and fillers required.

At completion of installation leave all cabinets clean and free of defects.

Wood Doors:

Hang all wood doors according to Door Schedule and Shop Drawings approved by Architect.

Leave each door neatly hung, swinging easily, and performing all functions intended by finish hardware schedule.

Install double coat hooks on all Administration suite wood doors.

CLEANUP: At completion of all Finish Carpentry, Cabinetwork and Millwork installations clean up all areas in which work was performed and leave ready for installation of related work.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

DESCRIPTION OF WORK:

Work of this Section shall consist of furnishing all labor and materials required to insulate exterior CMU/brick cavity walls, exterior stud/brick cavity walls, interior stud walls, foundations, interior ceilings, and acoustical sound tubes all as shown on Drawings and as specified herein.

INDUSTRY STANDARDS:

For listing of names of industry standard agencies mentioned by abbreviation in this section refer to Section 01068.

QUALITY ASSURANCE:

Extent of insulation work is shown on drawings and indicated by provisions of this section.

Applications of insulation specified in this section include the following:

- Slab perimeter board insulation (supporting backfill).
- Spray Applied Polyurethane Insulation (interior and exterior)
- Ceiling fiberglass blanket Insulation.

QUALITY ASSURANCE:

Thermal Conductivity: Thicknesses indicated are for thermal conductivity (k-value at 75 degrees F or 24 degrees C) specified for each material. Provide adjusted thicknesses as directed for equivalent use of material having a different thermal conductivity. Where insulation is identified by "R" value, provide thickness required to achieve indicated value.

SUBMITTALS:

Product Data: Submit manufacturer's product specifications and installation instructions for each type of insulation and vapor barrier material required.

PRODUCT HANDLING:

General Protection: Protect insulation from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.

PART 2: PRODUCTS

SLAB PERIMETER INSULATION:

Extruded Polystyrene Board Insulation: Rigid, closed-cell, extruded, expanded polystyrene insulation board with integral high-density skin and tongue and groove edges; complying with FS HH-I514, Type IV,

min. 20 psi compressive strength, k-value of 0.20; 0.3% maximum water absorption; 1.1 perm-inch max. water vapor transmission; manufacturer's standard lengths and widths.

Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work included, but are not limited to, the following:

Manufacturer: Subject to compliance with requirements, provide products of one of the following:

- Dow Chemical Co., Midland, MI (Styrofoam SM)
- UC Industries/U.S. Gypsum; Chicago, IL (Foamular)

SPRAY APPLIED POLYURETHANE CAVITY WALL INSULATION:

Provide labor, materials, and equipment necessary to spray-apply closed-cell polyurethane foam (SPF) insulation, air seal and water repellent treatment for cavity wall CMU throughout the Project. Not required at CMU surfaces to receive EIFS finish, and not required for below floor foundation cavity CMU walls.

Spray Polyurethane Foam Insulation shall be a seamless self-adhering spray-applied rigid polyurethane foam system, forming a membrane that seals CMU surfaces. Spray apply in liquid form, to form a seamless, thermal, moisture and air barrier and envelope across CMU to structural steel surfaces, and at wall-to-roof decking transition areas.

Application: Substrate to which insulation is applied must be clean, dry as confirmed by testing, and free of frost, ice, loose debris, or contaminants that will interfere with adhesion of the spray applied insulation.

Apply primers to surfaces where required by manufacturer's installation instructions. Spray apply to substrates when ambient air temperatures no less than 50 degrees F or as authorized by manufacturer, and when ambient humidity is within manufacturer's guideline ranges, and following all manufacturer's installation guidelines. Apply after the perimeter wall is in place, and rough-in plumbing and electrical penetrations inspections are completed.

Mask off all areas and surfaces to not to receive insulation. Upon completion, remove all overspray, and remove all masking materials. Shield the spray polyurethane foam from interior exposure with an approved thermal barrier.

Where damage occurs which violates the spray foam's air seal and moisture seal, repair as needed using specified spray polyurethane material or specified foam repair kit material.

Accessories:

Foam Repair Material: Provided by manufacturer or equivalent.

Moisture Detection Paper (MDP) Strips: MDP Strips manufactured by NCFI Polyurethanes or equivalent

Physical Characteristics and Properties: Foamed-In-Place Stud Wall Insulation shall equal or exceed the following:

- A. Core density: 1.9 – 2.2 lbs/cu.ft. per ASTM D-1622
- B. Compressive Strength: 15 psi (min) per ASTM D-1621
- C. R-Value: 6.2 (min) per inch, per ASTM C-518
- D. Moisture Vapor Transmission: < 1.0 at 2" thick
- E. Air Leakage: 0 at 1.57 psf, per ASTM E-283
- F. Surface Burning Characteristics: Flame Spread Index < 25 and Smoke Developed Index < 450 per ASTM E-84

Acceptable Products:

- A. InsulBloc by NCFI Polyurethanes, PO Box 1528, Mt. Airy, NC 27030
- B. Incylthane by Polymaster

- C. CertainTeed
- D. Or equivalent products per information submitted to and accepted by the Architect.

Quality Assurance:

- A. Insulation shall be installed per the manufacturer's printed instruction submitted to the Architect prior to the start of work.
- B. Insulation shall be installed by a contract installer who has been trained and certified by the manufacturer. The contract installer shall have not less than three (3) years experience in the trade and be properly licensed to perform the scope of work.
- C. Follow and adhere to all manufacturer's and OSHA safety guidelines.
- D. Upon completion of the installation, the contract installer shall provide 4-color infrared thermal images of all exterior wall surfaces to the Architect to confirm that the spray applied cavity insulation completely covers all surfaces required to be insulated, with the required thickness. If the thermal images show voids, the contract installer shall apply foam to correct the deficiency at no added cost to the Owner.
- E. Provide a one year product performance warranty by the manufacturer.

FOAMED-IN-PLACE STUD WALL CAVITY INSULATION:

Foamed-In Place Stud Wall Cavity Insulation shall be a seamless two-component, one-to-one by volume, self-adhering spray-applied rigid polyurethane foam system, using blowing agent HFC-245fa, and including an anti-microbial ingredient.

Application: Substrate to which insulation is applied must be clean, dry, and free of frost, ice, loose debris, or contaminants that will interfere with adhesion of the spray foam insulation. Apply primers to surfaces where required by manufacturer's installation instructions. Spray apply to substrates when ambient air temperatures are between 50 degrees F and 120 degrees F, following all manufacturer's installation guidelines. Apply after the perimeter wall is in place, windows and doors installed, and rough-in plumbing and electrical inspections are completed. Mask off all areas not to receive insulation and release agent to stud facings to facilitate removal of foam. Remove all overspray and overfill from interior stud facings, remove all masking materials.

Accessories:

Joint Filler Foam: Hilti CF 124 Filler Foam or equivalent.
Caulk: Sikaflex 1a single component polyurethane or equivalent

Use joint filler foam and/or caulk to seal around windows, doors electrical raceways, multi-piece metal stud sill plates and headers, multiple joined studs, wall opening perimeters, etc.

Physical Characteristics and Properties: Foamed-In-Place Stud Wall Insulation shall equal or exceed the following:

- A. Core density: 1.9 – 2.5 lbs/cu.ft. per ASTM D-1622
- B. Compressive Strength: 20 – 27 psi per ASTM D-1621
- C. R-Value: 6.4 per inch (aged), per ASTM C-518
- D. Closed Cell Content: > 90% per ASTM D-2856
- E. Moisture Vapor Transmission: 0.7 at 2" thick
- F. Surface Burning Characteristics: Flame Spread Index ≤ 25 and Smoke Developed Index ≤ 450 per ASTM E-84

Acceptable Products:

- A. NCFI Spray Foam System 11-012 by NCFI Polyurethanes, PO Box 1528, Mt. Airy, NC 27030
- B. Bayseal CC by BaySystems
- C. Styrofoam Brand SPF Insulation by Dow Chemical Company
- D. Or equivalent products per information submitted to and accepted by the Architect.

Quality Assurance:

- A. Insulation shall be installed per the manufacturer's printed instruction submitted to the Architect prior to the start of work.
- B. Insulation shall be installed by a contract installer who has been trained and certified by the manufacturer. The contract installer shall have not less than three (3) years experience in the trade and be properly licensed to perform the scope of work.
- C. Follow and adhere to all manufacturer's and OSHA safety guidelines.
- D. Upon completion of the installation, the contract installer shall provide 4-color infrared thermal images of all exterior wall surfaces to the Architect to confirm that foamed-in-place stud wall insulation completely fills all spaces required to be insulated. If the thermal images show voids, the contract installer shall apply foam to correct the deficiency at no added cost to the Owner.
- E. Provide a one year product performance warranty by the manufacturer.

Alternative Barrier System Required in Areas Not Protected with Drywall or Masonry:

- A. Areas of Spray Foam Insulation not protected with Drywall or Masonry shall be protected with an approved intumescent covering, equal to International Fireproofing Technologies, Inc., "DC-315", spray applied 21 mils wet / 14 mils dry minimum, meeting all requirements of the NC Building Code and IRC.

CEILING INSULATION:

Unfaced Blanket-type Glass Fiber Ceiling Insulation: Inorganic non-asbestos fibers formed into semi-rigid blankets, R-11, 24" x 48" batt size. Do not insulate over lighting fixtures. Provide over all ceilings continuous, unless otherwise noted.

PART 3: EXECUTION

INSPECTION AND PREPARATION:

Installer must examine substrates and conditions under which insulation work is to be performed, and must notify Contractor in writing of unsatisfactory conditions. Do not proceed with insulation work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

Clean substrates of substances harmful to insulations or vapor barriers, including removal of projections which might puncture vapor barriers.

INSTALLATION:

General:

Comply with manufacturer's instructions for particular conditions of installation in each case. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.

Extend insulation full thickness as shown over entire area to be insulated. Spray, cut and fit tightly around obstructions, and fill voids with insulation. Remove projections which interfere with placement.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

TYPE AND SEQUENCE OF CONSTRUCTION

New roof insulation over new steel roof deck. New roof system shall meet fire resistance Class A requirements and wind uplift resistance meeting ASTM E1592 and UL/FM I-90.

RELATED SECTIONS

07610 Metal Roofing

SUBMITTALS

Product Data:

1. Product data sheets.
2. Product samples.

DELIVERY, STORAGE, AND HANDLING

Deliver and store products according to general requirements for materials and equipment and Part 3 of this Section.

Provide unopened containers and packages with labels bearing producer(s) name and source of product and date of manufacture. Factory Mutual approval or Underwriters Laboratories Classification shall be on package.

Keep roof insulation protected while in storage; keep dry during application. Outdoors, store off ground on pallets protected with breathing type covers. Roof insulation which has been wet, and then dried, may be used only if approved by Architect.

ENVIRONMENTAL REQUIREMENTS

Install roof insulation only when surfaces are dry.

Do not install roof insulation if moisture content of substrate is above that acceptable to roof insulation and roof membrane producer.

PART 2: PRODUCTS

ROOF INSULATION

Vapor Barrier - 10 mil Polyethylene with lapped edges taped.

Product: Rigid polyisocyanurate board, with a coated glass-fiber facer conforming to or exceeding the requirements of ASTM C 1289, Type II, Class 1 / FS HH-I-1972. Compliance with FM Standard 4450/4470.

Equivalent to: ENRGY 3 Polyisocyanurate Roof Insulation, by Johns Manville
ACFOAM-II Polyisocyanurate Roof Insulation, by Atlas

Thickness: 2 layers/courses; for a total R-30 assembly

<u>Property</u>	<u>Test Method</u>	<u>Value</u>
Tensile Strength:	ASTM C209	730 psf
Thermal Resistance (LTTR):	ASTM C518	R 5.7 per inch
Water Absorption:	ASTM C209	1.0% by volume, maximum
Water Vapor Permeance:	ASTM E96	1.5 perm maximum
Dimensional Stability:	ASTM 2126	2% linear change, maximum
Maximum Operating Temperature:	ASTM D 1623	-100 F to 250 F
Product Density:	ASTM D1622	Nominal 2 pcf
Compressive Strength:	ASTM D1621	Grade 3: 25 psi minimum
Flame Spread:	ASTM E84	20-30
Smoke Developed:	ASTM E84	55-250

Referenced Standards:

Section 2603, FOAM PLASTIC INSULATION, International Building Code

ASTM: ASTM C 1289, Type II, Class 1

Underwriters Laboratories: Class A for Roof System External Flame – UL Standard 790

Insulation shall meet criteria for UL 1256 for a fire classified system.

Underwriters Laboratories: UL Construction No. 263

FM Standards 4450 / 4470

Insulation Board Joint Tape: Weather resistant self-adhering heavy-duty tape as recommended by roof insulation manufacturer.

PART 3: EXECUTION

ROOF INSULATION APPLICATION:

GENERAL

Lay roof insulation in staggered courses parallel to roof edges.

Stagger end joints of each course, both layers.

Miter roof insulation edges at ridges, valleys, and other similar non-planar conditions. Butt edges to provide moderate contact; do not smash edges. Provided in layers specified with each layer's joints taped.

PROTECTION

Protect roofing work from foot traffic and construction damage.

CLEAN UP

Remove excess materials, trash, debris, equipment, and parts from the Work.

Repair, or remove and replace, damage and stains caused by roofing work.

FIELD QUALITY CONTROL:

Protection: If work is stopped before completion of application of roof insulation and roofing, protect exposed insulation. Seal edges to prevent penetration of moisture. Do not lay more insulation in one working day than can be covered by roofing in same day.

Inspection: Architect shall be notified to inspect work after completion of vapor barrier and completion of roof insulation. If this examination discloses that work is not according to Specification, or that work has been damaged by traffic or other trades, Contractor shall agree to furnish additional materials necessary to make repairs and place work in acceptable condition.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

DESCRIPTION OF WORK:

Spray-apply fireproofing in required thicknesses and densities on structural steel members to produce required rate of fire resistance as scheduled in this Section and shown on plans, as outlined in UL Fire Resistance Directory Designs.

INDUSTRY STANDARDS:

For listing of names of industry standard agencies mentioned by abbreviation in this Section, refer to Section 01068.

QUALIFICATIONS:

Manufacturers:

Standard: For purposes of designating type and quality for the work under this Section, Drawings and Specifications are based on products manufactured or furnished as indicated below and approved by the testing agency referenced on the detailed drawings.

Acceptable Manufacturers: Following manufacturers, meeting all requirements of these specifications will also be acceptable for work in this Project.

W.R. Grace Company
Pyrock
Carboline, Inc.
CAFCO SFRM

Qualifications of Applicator:

Licensed or certified by manufacturer of fireproofing materials.

Applicator shall be experienced in performing application of materials on two projects with similar quantities of sprayed fireproofing materials. Provide names of projects and contact numbers of contractor.

Requirements of Regulatory Agencies:

Current building code requirements of the State of North Carolina for fire resistance ratings of areas to receive sprayed fireproofing materials. (2006 North Carolina State Building Code – 2003 International Building Code with North Carolina Amendments)

Underwriters Laboratories Assemblies:

UL D916
UL P741

SUBMITTALS:

Test Reports:

Submit copies of UL fire test reports of sprayed fireproofing application to substrate materials required.

Submit certified test reports of acceptable testing agencies which perform testing in accordance with ASTM E119 and E84.

RATING SCHEDULE (THICKNESSES): Submit manufacturer's UL approved design thickness attesting as to UL Designs necessary to achieve ratings.

PRODUCT HANDLING:

Delivery: Deliver materials to project site in manufacturer's original, unopened containers with manufacturer's brand name clearly marked thereon.

Storage: Store materials under cover in dry place.

PART 2: PRODUCTS

MATERIALS:

CEMENTITIOUS SPRAY FIREPROOFING SYSTEMS:

Concealed Areas:

Carboline Southwest Type 5GP
W. R. Grace Company – MK-6/HY
Carboline - Pyrolite 15-High Yield
CAFCO SFRM

Exposed Areas:

Carboline Southwest Type 5MD
W. R. Grace Company – Type Z146
Pyrocrete 40
CAFCO SFRM

Composition: Product shall contain no asbestos fiber and shall have high resistance rating to dusting, flaking, delaminating. Product shall not contain mineral fiber.

PART 3: EXECUTION

APPLICATION:

Apply strictly according to approved manufacturer's printed instructions.

Provide adequate ventilation during entire application process. Provide forced air ventilation at a rate of 3 air exchanges per hour until completely dried.

Apply manufacturer's required bond adhesive to all surfaces to receive fireproofing prior to application of fireproofing, installed as per manufacturer's installation instructions.

Apply fireproofing only after roof installation is completed and is watertight, and roof traffic has ceased.

PROTECTION:

Protect all fireproofing at all times following application until permanent covering or finish material is placed over it. Patch and repair as required after all trades have completed work that could damage fireproofing.

QUALITY ASSURANCE:

Test fireproofing for thickness and densities, per ASTM E605-93 at a frequency of 1 beam, 1 column, 1 deck (if applicable) for every 10,000 sq. ft. of floor space, or 1 per every floor.

Any fireproofing found to be deficient in thickness or densities, contractor shall repair / replace fireproofing and retest per ASTM E605-93 at contractor's expense.

RATING SCHEDULE (THICKNESSES): Provide manufacturer's UL approved design thickness schedule attesting as to UL Designs necessary to achieve ratings.

END OF SECTION

RELATED DOCUMENTS:

The general provisions of the Contract, including General and Supplementary Conditions, and General Requirements, and Division 1 specifications that apply to the work specified in this Section.

PART 1 - GENERAL

RELATED WORK SPECIFIED ELSEWHERE:

07610 Metal Roofing

DESCRIPTION OF WORK:

Contract work of this Section shall include, but not be limited to providing following:

All sheet metal work required for complete assemblies of items specified at all areas indicated on Drawings:

- Gutters
- Downspouts
- Copings
- All sheet metal work required for moisture control
- Metal valley flashing
- Metal base and counterflashings

INDUSTRY STANDARDS:

For listing of names of industry standard agencies mentioned by abbreviation in this Section refer to Section 01068.

Standards: Workmanship and methods employed for forming, anchoring, cleating, and expansion and contraction of sheet metal work shall conform to application details and description as indicated in current edition of Architectural Sheet Metal Manual, published by Sheet Metal and Air Conditioning Contractors National Association, Inc. and hereinafter referred to as "SMACNA Manual", unless otherwise noted on Contract Drawings or specified herein.

QUALITY ASSURANCE:

Manufacturers:

Standard: For purposes of designating type and quality for the work under this Section, Drawings, and Specifications are based on products manufactured or furnished by Manufacturers listed under PRODUCTS.

SUBMITTALS:

Shop Drawings: Submit for approval in accordance with GENERAL CONDITIONS.

Details and layout shall show weights, gauges or thicknesses of sheet metal, joints, expansion joint spacing, and procedures to be followed during installation. Indicate bolt size and spacing, nailers or blocking required to be furnished by others for securing work of this Section.

Catalog Cuts: For Standard manufactured items, catalog cuts may be submitted as specified in GENERAL CONDITIONS.

Guarantee: Installation of all items of this Section shall be guaranteed to be leak-free for period of five years from date of acceptance of project. Any repairs or replacements required to maintain waterproof installation shall be done at no cost to Owner.

PRODUCT HANDLING:

Handling and Storage: Damaged items that cannot be restored to like-new condition shall be removed and replaced at no additional cost to Owner.

PART 2 - PRODUCTS

MATERIALS:

Flatwork, Flashings, Copings, Gutters and Gravel Stops: Pre-finished 24 gauge galvalume steel sheet, 0.5 ounces/square foot, minimum yield of 50,000 PSI.

Gutter: 24 gauge pre-finished galvalume gutter. Provide pre-finished gutter spacers and brackets as shown on Drawings.

Finish: Premium fluorocarbon coating produced with Kynar 500 or Hylar 5000 resin

Downspouts: Downspouts, 20 gauge pre-finished galvalume, Kynar 500 finish. Wall mounting brackets shall be matching material.

ACCESSORIES:

General: Provide all accessories or other items essential to completeness of sheet metal installation, though not specifically shown or specified. All such items shall be of same material or compatible to base material to which applied and gauges shall conform to SMACNA Manual recommendations.

Fasteners: All screws, bolts, rivets and other fastenings for sheet metal, unless otherwise noted, shall be like material and of size and type suitable for intended use, stainless where indicated.

Sealant: Elastomeric polyurethane sealant equal to Sonneborn Sonolastic NP-1. Clean all sheet metal surfaces prior to application with xylene and prime with Primer equal to Sonneborn 733 primer. Follow manufacturer's written product installation guidelines, recommendations and instructions. Color to be selected by Architect.

PART 3 - EXECUTION

CONDITION OF SURFACES:

Proper Surfaces: Surfaces to which sheet metal and flashing are applied shall be even, smooth, sound, thoroughly clean and dry and free from projections or other defects that would affect application. Defects shall be corrected by trades involved before installation of sheet metal work.

INSTALLATION:

Workmanship: Fabricate and install sheet metal with lines, arises, and angles sharp and true, and plane surfaces free from waves warps, or buckles, match existing work unless shown otherwise. Exposed edges of sheet metal shall be folded back to form 1/2 inch wide hem on side concealed from view. Finished work shall be free from water leakage under all weather conditions.

Fastenings: Unless otherwise indicated or specified, all fastenings shall be concealed. Installation of and joints of all sheet metal work, including fascia claddings, shall be in accordance with recommendations of SMACNA.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

1.01 DESCRIPTION

A. General

1. Furnish all labor, material, tools, equipment, and services for a complete roofing and wall panel system to include all flashing, curbs, gutters and downspouts as indicated, in accordance with provisions of Contract Documents.
2. Completely coordinate with work of all other trades.
3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
4. See Division 1 for General Requirements.

B. Related work specified elsewhere:

1. Flashing and sheet metal: Section 07600.
2. Drawings Building Code Summary

1.02 QUALITY ASSURANCE

A. Applicable standards:

1. SMACNA: "Architectural Sheet Metal Manual" Sheet Metal and Air Conditioning Contractors National Association, Inc.
2. AISC: "Steel Construction Manual" American Institute of Steel Construction.
3. AISI: "Cold Form Steel Design Manual," American Iron and Steel Institute.
4. ASTM A792-AZ50: Specifications for steel sheet, aluminum-zinc alloy coated (galvanized) by the hot dip process, general requirements (galvalume).
5. Underwriters Laboratories Inc. wind uplift classification UL 90
6. 2000 International Building Code, Table 1604.5, Classification Of Buildings And Other Structures For Importance Factors, Category II Seismic, Snow and Wind Factors.
7. 2000 International Building Code, Table 1604.5, Classification Of Buildings And Other Structures For Importance Factors, Category III Seismic, Snow and Wind Factors.
8. LEEDS NC, U. S. Green Building Council
9. Energy Star Roof Rating

10. Cool Metal Roof Coalition

11. Cool Roof Rating Council

B. Manufacturer's qualifications:

1. Manufacturer has a minimum of three years experience in manufacturing panels of this nature.

C. Installer's qualifications:

1. Installation of panels and accessories by installers with a minimum of two years experience in panel projects of this nature.

1.03 SUBMITTALS

A. Shop drawings:

1. Submit complete shop drawings and erection details to Architect for review. Do not proceed with manufacture prior to review of shop drawings. Do not use drawings prepared by Architect for shop or erection drawings.
2. Shop drawings show methods of erection, elevations, and plans of roof and wall panels, sections and details, anticipated loads, flashings, roof curbs, vents, sealants, interfaces with all materials not supplied and proposed identification of component parts and their finishes.
3. Manufacturer's Information: Describe available LEED points.
4. Certification: Manufacturer to certify that roof system submitted is in compliance with Building Category Importance Factors requirements

B. Samples:

1. Submit samples and color chips for all proposed finishes.
 - a. Submit one 8 in. long sample of roof panel, including clips.
 - b. Submit one 8 in. long sample of wall panel, including clips.
 - c. Submit 3 in. x 5 in. color chip samples in all standard colors.

C. LEEDS NC: Submit certification from Manufacturer of roofing materials and accessories that products are sustainable products, listing all applicable LEED U.S. Green Building code council's credits made available by certification.

D. Warranty

1. Provide manufacturer's written NDL (No Dollar Limit) weathertightness warranty twenty (20) years, against leaks in roof panels arising out of or caused by ordinary wear and tear under normal weather and atmospheric conditions. Warranty coverage shall include all curbs, flashing and miscellaneous trim and accessories. Warranty shall be non-pro-rated, signed by the metal roofing system manufacturer and shall provide for both labor and materials.

2. Provide manufacturer's NDL (No Dollar Limit) written warranty for twenty (20) years against perforation of metal roof panels due to corrosion under normal weather and atmospheric conditions. Warranty shall be signed by metal roofing system manufacturer and shall provide for complete replacement of panels and associated trim.
3. Provide manufacturer's NDL (No Dollar Limit) written paint film warranty for twenty (20) years on finish film integrity and color retention. The finish will not crack, check, peel, flake, or blister, or chalk in excess of ASTM 4214, number 8 rating, or fade in excess of 5 units per ASTM D 2244, under normal atmospheric conditions. Warranty shall be signed by metal roof system manufacturer.
4. Inspection and Report Services: Contractor shall retain independent third party agent who shall perform an inspection of the entire roof system and shall submit a written report to the Owner detailing all conditions requiring maintenance and repair by parties under the above warranties. Third party agent shall be a registered roof consultant (RRC) with minimum of 5 years as a registered roof consultant and 5 years of active project experience. Provide written certification of qualifications.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Obtain roofing products from local regional source, within 500 miles of project site.
- B. Delivery: Deliver panels to jobsite properly packaged to provide protection against transportation damage.
- C. Handling: Exercise extreme care in unloading, storing and erecting panels to prevent bending, warping, twisting, and surface damage.
- D. Storage: Store all material and accessories above ground on well skidded platforms. Store under water- proof covering. Provide proper ventilation to panels to prevent condensation build-up between each panel.

PART 2: PRODUCTS

2.01 MATERIALS

- A. Roof panel profile: 2 in. high x 3/4 in. wide rib x 16 in. wide striated panel.
- B. Panel style: Large batten, vertical leg, concealed fastener, standing seam, utilizing male and female rib configurations, with factory applied hot melt mastic in female rib, continuously locked together by an electrically powered mechanical seaming device during installation.
- C. Gauge: 24 gauge (UL-90 rated - Underwriters Laboratories).
- D. Substrate: Galvalume steel sheet, 0.5 ounces/square foot, minimum yield of 50,000 PSI.
- E. Recycled Content: Metal roof materials shall be 35% recycled content.
- F. Clip: Floating clip, low, 22 gauge, with factory applied mastic (# UL-90 rated-Underwriters Laboratories).
- G. Texture: Smooth.

- H. Finish: Premium fluorocarbon coating produced with Kynar 500 or Hylar 5000 resin (20 year warranty).
- I. Reflectivity and Emissivity: Metal roof Panels shall be high reflectance and high remittance in accordance with Energy Star. Initial Reflectance (Galvalume Only) shall be at least 0.68 when tested with ASTM E-903. The three year aged reflectance shall be at least 0.57, when tested in accordance with ASTM E-1918 (Measured AS Solar Reflectivity, Not Visible Reflectance).
- J. Color: Selected from manufacturer's standard Energy Star Rated roof colors, with Solar Reflectance Index (SRI) value equal to or greater than SRI 29.
- K. Acceptable manufacturer: MBCI; Product: BattenLok Series
- L. Acceptable optional manufacturers:
 - 1. Equivalent products by:
 - i. AEP Span
 - ii. American Building Company
 - iii. Butler Manufacturing Company
 - iv. McElroy Metal, Maxima 216
 - v. Peterson Aluminum Corporation, Tite-Loc
- M. Provide downspouts in profiles, shapes and materials as indicated on Drawings, 24 gauge and 20 gauge galvalume galvanized steel with Kynar 500 or Hylar 5000 resin finish. Provide straps, brackets and anchors in matching material as indicated on Drawings.
- N. Pipe flashing shall be Dektite, or equivalent by Master Flash, Westform Metals or IPS Roofing Products.
- O. Provide roof and gutter expansion joints as indicated on Drawings, in matching Kynar 500 or Hylar 5000 resin finish.
- P. All roof curbs are by metal roof contractor. Refer to mechanical drawings and coordinate curbs required with HVAC Contractor.
- Q. Provide special rolled / radiused panels and trim where shown on drawings.
- R. Ribbed wall panels where indicated on Drawings shall be fabricated from 24 gauge Galvalume galvanized steel, fluoropolymer Kynar 500 factory applied paint system with a 20-year finish warranty, formed to provide a weathertight closure assembly. Panel shall be a 12" wide, concealed fastener type, smooth finished, flat profiled with reverse rib fastener legs. Provide all accessories, trims, channels and flashings for a complete assembly. Provide panels equivalent to FW-120 Panel by MBCI.
- S. Provide special shapes where shown on drawings.
- T. Metal soffit panels and trim where indicated to be .019" aluminum, smooth finish, factory finish, custom color. Provide ventilated panels every 5th panel or where detailed. Soffit system to be Revere Hi-Tensile or equivalent by Alcoa or Owens Corning
- U. Self-adhering polymer modified bituminous membrane, 40 mil minimum thickness, Vycor Ice and Water Shield by W.R. Grace or equivalent products by GAF Materials Corp. or Calisle Coatings and Waterproofing. Apply continuous over entire roof surface.

2.02 FABRICATION

- A. Material shall be in-line tension leveled prior to roll forming finished panel profile.
- B. Factory roll form panels in continuous lengths, full length of detailed runs. Field formed panels will not be accepted.
- C. Standard panel length shall be no more than 45 feet.
- D. Panel laps shall be 5" minimum.
- E. Fabricate trim, flashing and accessories to detailed profiles.
- F. Fabricate trim and flashing from same material as panel.

PART 3: EXECUTION

3.01 SURFACE CONDITIONS

- A. Examination
 - 1. Inspect installed work of other trades and verify that such work is complete to a point where this work may continue.
 - 2. Verify that installation may be made in accordance with approved shop drawings and manufacturer's instructions.
- B. Discrepancies:
 - 1. In event of discrepancy, notify Architect.
 - 2. Do not proceed with installation until discrepancies have been resolved.

3.02 INSTALLATION

- A. Install panels so that they are weathertight, without waves, warps, buckles, fastening stresses or distortion, allowing for expansion and contraction.
- B. Install panels in accordance with manufacturer's instructions and shop drawings.
- C. Provide concealed anchors at all panel attachment locations.
- D. Install panels plumb, level, and straight with seams and ribs/battens parallel, conforming to design as indicated.
- E. Do not place scratched panels or material in the work.
- F. Metal roofing contractor is responsible for cutting and sealing all roof penetrations and installations of all curbs. Refer to plumbing and mechanical drawings. Coordinate roof penetrations and curbs required with Plumbing and HVAC Contractors.
- G. Install 40 mil self-adhering polymer modified bituminous membrane ice and water shield, continuous over entire roof surface, from all eave edges up slope up to ridges, across all valleys, and overlap at ridges.

3.03 CLEANING, PROTECTION

- A. Dispose of excess materials and remove debris from site.
- B. Clean work in accordance with manufacturer's recommendations.
- C. Protect work against damage until final acceptance. Replace or repair to the satisfaction of the Architect, any work that becomes damaged prior to final acceptance.
- D. Scratched panels or scratched flat surfaces will not be accepted. Scratched materials shall be replaced with new matching material at contractor's expense. Repainting to conceal surface scratches will not be accepted.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

DESCRIPTION OF WORK :

Work of this Section shall require furnishing all labor and materials to provide sealants, non-rated caulking, fire-rated fire caulking, and related primers, including expansion joint fillers, interior and exterior, as shown on Drawings and as specified in this Section.

Caulking and primers required for installation of all work included in Sections for Window Wall, Storefront Systems shall be part of work under that Section and shall be done in accordance with the applicable portions of this Section.

Acoustical caulking for installation of gypsum board is specified in Section 09250.

Required applications of sealants and caulking include, but are not necessarily limited to, following general locations:

- Flashing reglets and retainers.
- Coping Members, Bed and Joints.
- Interior and exterior wall joints around doors and windows perimeters.
- Exterior wall control joints
- Horizontal and vertical interior CMU wall and structural steel joints
- Joints at penetrations of walls, decks and floors by piping and other services and equipment.
- Fire-rated penetrations of walls, decks and floors by piping and other services and equipment.
- Concrete walk and pavement expansion joints
- Exposed interior concrete floor slab control joints

Required applications of joint fillers and gaskets include, but are not necessarily limited to, the following general types of work and locations:

- Expansion joint fillers in structural concrete.
- Exterior wall expansion joint fillers.
- Fire-rated pipe and conduit through penetrations.

INDUSTRY STANDARDS:

For listing of names of industry standard agencies mentioned by abbreviation in this Section refer to Section 01068.

ASTM E 814 (UL 1479) Standard Tests of Penetration Firestop Systems

ASTM E 1966 (UL 2079) Standard Test Method for Fire Resistive Joint Systems

UL - Underwriters Laboratory

ASTM C 920

Comply with 21 CFR 177.2600 for sealants in contact with food.

LEED SC, U. S. Green Building Council

SCAQMD - South Coast Air Quality Management District

QUALITY ASSURANCE:

Manufacturers:

Standard: For purposes of designating type and quality for the work under this Section, Drawings and Specifications are based on products of Sonneborn BASF Corporation and 3M Corporation.

Source: Products for use on this Project shall be of one Manufacturer, unless noted specifically otherwise.

All sealants shall comply with requirements of the South Coast Air Quality Management District (SCAQMD) Rule #1168.

SUBMITTALS:

Manufacturer's Data: For information only, submit 2 copies of Manufacturer's specifications, installation instructions and recommendations for each type of material required. Include Manufacturer's published data, certifications or laboratory test reports indicating that each material complies with requirements. Show by transmittal that copy of instructions and recommendations has been distributed to installer.

Submit applicable UL Tested Assemblies for each type of fire-rated through penetration and fire-stopping required.

Certifications: Submit written certifications that all primers, backings, and caulking materials are chemically compatible with each other and with the overcoating or topcoating materials.

Submit environmental certifications from Manufacturers of all joint sealant materials products, listing all applicable LEED credits made available by certifications.

Samples:

Caulking and Sealants: Submit samples of interior and exterior caulking compounds and related sealants required for installation. Install 12" samples in the work on site in locations requested by the Architect, for review.

Joint Fillers and Gaskets: Submit 3, 12" long samples of each joint filler or gasket which will be reviewed by Architect for color and texture only. Compliance with all other requirements is exclusive responsibility of Contractor.

Guarantee: Furnish Owner, in care of Architect, guarantee in accordance with requirements of General Conditions for period of three (3) years from date of acceptance of project against defective workmanship and materials, warranting airtightness and water tightness of exterior sealant and installation. Repairs shall be made promptly or material replaced after proper notice at no additional cost to Owner.

PRODUCT HANDLING:

Store and handle materials in strict compliance with Manufacturer's instructions.

Store in original containers until ready for use. Damaged material will be rejected and shall be removed from site.

PART 2: PRODUCTS

JOINT BACKING MATERIAL:

Non-Traffic Joints: Except where otherwise specified, packing shall be closed-cell expanded polyethylene cord or square rod conforming to ASTM D 1752, or closed-cell vinyl type conforming to ASTM D 1667, Grade VE-41.

Floor Joints: Packing shall be closed cell neoprene cord or square rod conforming to ASTM C 509-66T, with minimum shore "A" hardness of 45.

Fire-Rated Through Penetrations: non-combustible rock wool type mineral wool.

NON-RATED CAULKING COMPOUNDS /SEALANTS

Interior Joints: Caulking, other than where sealant is called for, shall be a solvent free, low modulus, one-part silyl-terminated polyether, non-sag sealant. Tack free time shall be minimum 90 minutes. Material shall be butyl-free skinning type, paintable within one hour.

Latex sealants are restricted to use only in non-moving joints in drywall construction.

Sonolastic 150 VLM manufactured by Sonneborn, or approved equal, with 7.24% of post-consumer material recycled content, VOC (volatile organic content) of 2 g/L.

TF-100 self-leveling 100% polyurea control joint filler, for interior exposed and bare concrete floor slab control joints; for Boiler and Mechanical rooms, custodial spaces. Not for use under VCT or carpeting adhered type floor finishes.

Exterior Joints: Caulking for exterior joints other than where other sealant is called for, shall be polyurethane:

Sonneborn NP-1 for walls, with 5% of post-consumer material recycled content, VOC (volatile organic content) of 43 g/L.

Sonneborn NP-2 for walls, with 5% of post-consumer material recycled content, VOC (volatile organic content) when mixed of 53-80 g/L.

Sonolastic SL-1 or SL-2 for concrete expansion joints in non-vehicular traffic areas, with 5% of post-consumer material recycled content, VOC (volatile organic content) maximum of 104 g/L.

Sonomeric 1 for concrete expansion joints in vehicular traffic areas, with 5% of post-consumer material recycled content, VOC (volatile organic content) maximum of 128 g/L.

Approved equivalent products by Tremco or Pecora are acceptable.

PRIMER:

Type: Primer, where required by Sealant Manufacturer, shall be solution or compound designed to insure adhesion of sealant and shall be compatible with sealant.

Source: Material shall be provided by Sealant or Caulking Manufacturer and shall be selected for compatibility with sealant, with substrate and shall be non-staining.

PRODUCT COMPATIBILITY: All primer, backing, and caulking materials shall be chemically compatible with each other for use as an assembly, and with all surfaces in contact with these materials.

FIRE BARRIER SEALANTS

All fire caulk sealants used for fire barriers shall have been tested and passed the criteria of ASTM E 814 (UL 1479) Standard Tests of Penetration Firestop Systems, ASTM E 1966 (UL 2079) Standard Test Method for Fire Resistive Joint Systems and CAN/ULC-S115 Standard Method of Fire Tests of Firestop Systems. All fire caulk sealants shall meet the requirements of the IBC, IRC, IPC, IMC, NFPA 5000, NEC (NFPA 70), NFPA 101 and NBCC. All fire caulks shall be listed in a tested and published through penetration UL assembly.

3M Fire Barrier Sealant FD 150+: one-component, gun grade, latex based elastomeric sealant. Paintable and repairable; firestops construction joints, and through penetrations. Not acceptable for use with CPVC pipe. VOC (volatile organic content) of <250 g/L.

3M Fire Barrier Silicone Sealant 2000+: one-component, gun grade, natural cure silicone elastomer based sealant; firestops dynamic construction joints, through penetrations, static construction joints, and blank openings. Non-paintable. VOC (volatile organic content) of <32 g/L.

3M Fire Barrier Sealant CP 25WB+: High-performance, one-component, gun-grade, latex-based, intumescent sealant. Paintable, firestops and seals single or multiple through penetrations, blank openings, and static construction joints. Not acceptable for use with CPVC pipe. VOC (volatile organic content) of <1 g/L.

3M Fire Barrier Water Tight Sealant 3000WT: High-performance, one-component, neutral cure, intumescent silicone sealant. Fully cured acts as barrier to water leakage, repairable, firestops single and multiple through penetrations, bottom-of-wall static construction joints, blank openings, VOC (volatile organic content) of <31 g/L.

Provide 3M Ultra GS Wrap Strip where required by the through penetration assembly.

PART 3: EXECUTION

Proper Surfaces: Material in contact with sealant shall be dry, full cured, and free of laitance, loose aggregate, form release agents, curing compounds, water repellents and other surface treatment that would be detrimental to adhesion of sealant.

Masonry shall be cleaned and joints raked to proper depth to receive back-up and sealant.

Concrete shall be finished joints cleaned and fins removed.

Curing: Joints in masonry, concrete and stucco work shall not be sealed until substrate has cured minimum of 28 days.

PREPARATION:

Joint Cleaning: Clean all joints thoroughly, and blow out or vacuum loose particles from joints. Surfaces with protective coatings (such as aluminum) shall be wiped with xylol or methyl ethyl ketone solvent to remove protective coatings and oil deposits.

Sheet Metal: New sheet metal shall be wiped down with copper sulphate solution or with strong acetic acid solution to etch the zinc coating and remove oil and foreign matter from surface.

Joint Design: Coordinate work of other trades so that shape of joint, dimensions, and anticipated movement shall conform to following: (Comply with manufacturer's joint design requirements)

Minimum Width: Opening not less than 1/4" wide.

Minimum Depth: Opening not less than 1/8" deep.

Maximum Movement: The width of the opening shall be at least 4 times its maximum movement.

Width Depth Ratio: Comply with manufacturer's joint design requirements. Unless otherwise required, the depth of the sealant shall be no greater than the width. Depth should be more than 1/8" and not more than 1/2" deep, unless otherwise required by manufacturer.

All caulking joints shall be recessed openings. "Fillet" type caulking into corners will not be acceptable.

Joint Packing: Packing shall be installed in all joints to receive sealant. Packing shall be sized to require 20% to 50% compression upon insertion, and placed in accordance with "Joint Design" paragraph. (In joints not of sufficient depth to allow packing, install polyethylene bond-breaking tape at back of joint). Avoid lengthwise stretching of packing material.

Masking: Apply masking tape where required to protect adjacent surfaces. Adhere tape in continuous strips in alignment with joint edge, and remove immediately after joints have been sealed and tooled.

INSTALLATION:

Application of sealants shall be as recommended by Sealant Manufacturer. Work shall be done with standard handguns or mechanical guns. Extrude sealant through nozzles of such diameter as to allow full bead of material to run into joint, but not to exceed width of joint. Force sealant into joint by tooling to insure full contact with sidewalls and backing.

Locations: Use sealants in locations hereinbefore specified for joints as specified.

Joint Finishing: Unless otherwise indicated, all joints in horizontal surfaces shall be finished flush, all joints in vertical surfaces shall be finished slightly concave in shape. Use tooling stick or knife to strike off excess material, and properly shape bead. Use xylol or toluene to prevent sealant from adhering to tooling stick. Finished bead shall be smooth, even, and free from all wrinkling, air pockets, and foreign matter.

Install expansion joint filler as recommended by Manufacturer. Filler shall be size recommended by Manufacturer for use in the expansion joint erected and shall be installed with special tool and adhesive-lubricant.

CLEAN-UP:

Excess Material: Remove all excess material adjacent to joint by mechanical means and/or with solvent (such as xylol or toluol). Leave work in neat and workmanlike manner.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

DESCRIPTION OF WORK:

Work required under this Section consists of providing galvanized hollow metal doors, frames, transoms, mullions, view window frames, and related items necessary to complete work indicated on Drawings and described in these specifications. Provide galvanized steel doors and frames for all openings where reasonably inferable from plan drawings, whether specifically scheduled and detailed or not.

INDUSTRY STANDARDS:

For listing of names of industry standard agencies mentioned by abbreviation in this Section refer to Section 01068.

Hollow Metal Manufacturers Association, HMMA

QUALITY ASSURANCE:

Manufacturers: Except as otherwise specified herein, all hollow metal doors and frames shall be products of one of following manufacturers, or an equal approved by Architect. Manufacturers shall be certified members of the Hollow Metal Manufacturers Association, HMMA. All doors and frames shall be from the same manufacturer.

- Amweld Bldg. Prod. Div.
- Ceco Corp.
- Curries Company
- Acme Steel Door Corporation
- Pioneer Fireproof Door Co.
- Steelcraft Mfg. Co.

SUBMITTALS:

Shop Drawings: Submit shop drawings, in accordance with GENERAL CONDITIONS, of all items specified herein to Architect for approval. Obtain approval of Drawings prior to proceeding with manufacturing. Shop drawings shall indicate following: elevations of each door type; details of each frame type; location in building for each item; conditions at openings with various wall thicknesses and materials; typical and special details of construction; methods of assembling sections; location and installation requirements for hardware; size, shape and thickness of materials; anchorage; joints and connections; and any additional pertinent information.

General Contractor shall field verify all door and frame sizes, door and frame prep requirements, and hardware prep requirements prior to fabrication.

Samples: Sample of door section indicating edge, top and/or bottom construction, insulation, hinge reinforcement and face stiffening. Sample of frame section showing welded corner joints, welded hinge reinforcements, dust covers and face finish.

PART 2: PRODUCTS

GALVANIZED METAL FRAMES: Except where otherwise scheduled, all frames for doors, shall be formed of galvanized steel to sizes and shapes indicated, to include but not limited to double and single rabbett frame profiles where indicated. Frames shall be combination type with integral trim and fabricated with full welded unit type construction at joints.

Type and Gauges of Metal: Metal for frames shall be commercial quality, cold-rolled, galvanized steel sheets, with clean smooth surfaces conforming to ASTM A 366. Except where other gauges are indicated or specified, frames shall be fabricated from steel, not lighter than following U.S. Standard gauges:

- Exterior frames - 14 gauge
- Interior frames to 3-0 in width - 16 gauge (generally)
- Interior frames over 3-0 in width - 14 gauge

Metal Reinforcements: Provide concealed metal reinforcements for hardware as required. Gauge of metal for reinforcement shall be in accordance with manufacturer's recommendations for type of hardware and the thickness and width of doors to be hung in frame, provided gauges used are not lighter than following:

- Hinge and pivot reinforcements - 7 gauge, 1-1/4"x 10" min. size.
- Strike reinforcements - 16 gauge reinforced cover box, concealing strike screws.
- Flush bolt reinforcements - 12 gauge.
- Closer reinforcements - 12 gauge.
- Surface-mounted hardware reinforcements - 12 gauge.

Workmanship and Design: Finished work shall be strong and rigid, neat in appearance, and free from defects. Fabricate molded members straight and true, with corner joints well formed and in true alignment, and with fastenings concealed where practicable.

Forming Corner Joints: Joints for welded type frames shall be mitered and continuously arc-welded for full depth and width of frame and trim. All contact edges shall be closed tight and all welds on exposed surfaces dressed smooth and flush.

Provisions for Hardware: Wood doors shall be solid core, prefitted. Prepare frames at factory for installation of hardware. Frames shall be mortised, reinforced, drilled and tapped to templates to receive all mortised hardware; frames to receive surface-applied hardware shall be provided with reinforcing plates only. Where concealed overhead door closers are required in frame members, provide necessary additional space, cutouts, reinforcement and provisions for fastenings in heads of frames to receive closers. Provide cover boxes in back of all hardware cutouts. Punch doorframes to receive rubber door silencers; provide three (3) silencers on lock side of single doorframes and one silencer for each leaf in heads of double doorframes.

Wall Anchors: Provide metal anchors of shapes and sizes required for adjoining type of wall construction. Fabricate jamb anchors of steel, not lighter than gauge used for frame. Locate anchors on jambs near top and bottom of each frame and at intermediate points not over 24" apart.

For frames set in masonry provide 10" long, corrugated or other deformed type adjustable anchors at jambs, 4 per jamb.

For frames set in metal stud partitions weld jamb anchor clips to back of frames at jamb. Make provision for securing anchors to steel studs with 1/4" round-head machine screws, nuts and washers, or by welding. Furnish 4 anchors per jamb.

Floor Anchors: Provide floor clips of not less than 16-gauge steel and fasten to bottom of each jamb member for anchoring frame to floor construction. Clips shall be fixed and drilled for 3/8" diameter anchor bolts.

Shipment: Provide temporary steel spreaders fastened across bottom of frames; where construction will permit concealment, leave spreader in place after installation; otherwise remove spreaders after frames are set and anchored.

GENERAL REQUIREMENTS FOR GALVANIZED METAL DOORS:

Type and Gauges of Metal: Metal for doors shall be commercial quality, leveled, cold-rolled, galvanized steel sheets with clean, smooth surfaces, conforming to ASTM A 366-68. All units shall be galvanized. Gauges of face sheets shall be as specified for door types.

Hardware Reinforcements: Doors shall be mortised, reinforced, drilled and tapped at factory for fully templated hardware only, in accordance with approved hardware schedule and templates provided by Hardware Contractor. Where surface-mounted hardware is to be applied, doors shall have reinforcing plates only; all drilling and tapping shall be done by others. Steel doors for locksets shall have welded box reinforcements.

All hardware furnished by Hardware Supplier for single-acting doors shall be designed for beveled edges as specified.

Edge Profiles shall be provided on lock stiles of doors as follows:

- Single-acting swing doors - beveled 1/8" in 2".
- Opposite swing double doors - beveled 1/8" in 2".

Provide clearances as follows:

Between doors and frames; at head and jambs - 1/8".

At doorsills; where no threshold is scheduled - 3/8" maximum. Allow for carpet height where required.

At doorsills; where threshold is scheduled - 1/4" maximum between door bottom and threshold.

Between meeting stiles of pair of doors - 1/8".

Workmanship: Finish work shall rigid, neat in appearance, and free from defects. Form molded members straight and true, with joints coped or mitered, well formed, and in true alignment. All welded joints on exposed surfaces shall be dressed smooth so that they are invisible after finishing.

GALVANIZED FLUSH DOORS:

Construction: Construct doors of two outer steel sheets not lighter than 18 gauge, with edges welded and finished flush. Seams or joints will not be permitted on door faces or edges. Reinforce the outer face sheets with 20-gauge interlocking vertical channels of Z-shaped members spaced not over 6" apart and spot-welded to outer face sheets. All doors shall have galvanized steel faces and rails.

Cap tops of exterior doors to prevent the accumulation of water.

Reinforcement: Provide continuous reinforcing channels welded to face sheets at top and bottom of door. Place cork, fiberboard, or mineral wool board in spaces between reinforcing channels.

Moldings shall be not lighter than 18-gauge steel. Doors shall be prepared to receive hardware specified under HARDWARE Section.

Optional Construction: Continuous truss-formed inner core of sheet metal, not lighter than 28-gauge, may be substituted for reinforcing specified, provided it is spot-welded to face sheets every 2-3/4" horizontally and vertically over entire surface of both sides.

APPROVED FIRE DOORS AND FRAMES:

Provide approved hollow metal fire doors and frames at locations indicated in Door Schedule. Approved doors, frames and hardware shall be constructed and installed in accordance with requirements of Underwriter's Laboratories for Class of door opening indicated or specified.

Fire doors and frames which bear Underwriter's label for class of opening indicated will be only basis of acceptance.

SHOP PAINTING / GALVANIZING:

All interior and exterior doors and all interior and exterior frames shall be galvanized.

Apply primed finish to all galvanized metal surfaces furnished in this Section.

Clean and chemically treat metal surfaces to assure maximum paint adherence; follow with dip or spray coat of rust-inhibitive metallic oxide, zinc chromate, or synthetic resin primer on all exposed surfaces.

Finish surfaces shall be smooth and free from irregularities and rough spots.

Approved primer shall be compatible with finish coats specified in Section 09900.

LOCATION OF HARDWARE: Location of hardware for hollow metal doors and frames shall be as specified in Section 08700.

PART 3: EXECUTION

ERECTION:

Hollow metal shall be erected by skilled workers. Frames shall be carefully plumbed and aligned. Trim and glazing stops shall be coped or mitered with hairline fit. Brace frames until permanent anchors are set. Anchor bottoms of frames to floor with expansion bolts or with power fasteners.

In application of glazing beads, or other trim parts, exercise care to avoid running screws or other fasteners tightly enough to dimple metal.

Minor damage to metal, incurred during erection, may be repaired by filling with lead or lead alloy ground smooth and flush, if strength and appearance of finish work are not impaired, and if Architect approved. Otherwise, furnish new material.

PROTECTION AND CLEANING:

Protect doors and frames from damage during transportation and at job site. Store at site under cover on wood blocking or on suitable floors.

After installation, protect doors and frames from damage during subsequent construction activities.

Damaged work will be rejected and shall be replaced with new work.

Upon completion, metal surfaces of doors and frames shall be thoroughly cleaned, ready for paint finish by others.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART I: GENERAL

DESCRIPTION OF WORK:

Work of this Section shall include furnishing, delivering, and storing where directed at site, the following:

Solid Core Wood Doors, as shown on drawings and specified herein. Intent of drawings and specifications is to provide all wood doors for the entire project as indicated on plans, whether specifically scheduled or not. Provide wood doors for all openings where reasonably inferable from plan drawings.

INDUSTRY STANDARDS:

For listing of names of industry standard agencies mentioned by abbreviation in this Section refer to Section 01068.

SUBMITTALS:

Submit complete schedule indicating dimensions, cutouts, hardware sets, species, and other pertinent data, which references the individual architectural door mark number as shown on the plan sheets.

General Contractor shall field verify all door and frame sizes, door and frame prep requirements, and hardware prep requirements prior to fabrication.

Submit Manufacturer's data sheets, completely describing door construction, WDMA I.S. 1-A (formerly NWWDA) and AWI Classifications.

Door Supplier to submit written certification on the supplier's letterhead that the doors provided shall conform to every aspect of this specification.

Door physical finish samples shall accompany submittals. The samples will show the range of color variation.

Warranty statement shall accompany the submittal.

QUALITY ASSURANCE:

Flush wood veneer doors shall conform to the latest edition of the following standards: WDMA I.S. 1-A requirements for "Premium Grade".

Tolerances for warp, telegraphing, squareness, and prefitting dimensions as per the latest editions of WDMA I.S. 1-A, AWI Section 1300 and NFPA 80 1-11.4, 1999 edition.

Each door shall bear an identifying label indicating the manufacturer, door number and order number, as well as fire rating where applicable.

Where fire rated doors are required, provide doors labeled by ITS/Warnock Hersey International. Construction details and hardware application shall be as approved by the labeling agency.

Provide doors to meet UBC 7-2-1997 requirements for positive pressure opening assemblies in areas where this has been adopted by local authorities having jurisdiction.

MANUFACTURERS:

Standards: For purposes of designating type and quality for work under this Section, Drawings and Specifications are based on 5-ply door products meeting WDMA I.S. 1-A Premium Grade manufactured or furnished by Marshfield Door Systems.

Acceptable Manufacturers: Products of following manufacturers, meeting all requirements of these specifications, will also be acceptable.

- Marshfield
- Eggers Doors
- Oshkosh
- Algoma
- VT Industries

Samples: Sample corner section of door indicating edge, top/and/or bottom construction, core and hardware reinforcement.

Color Samples: Provide physical color samples in the veneer species specified, in the full range of manufacturer's standard colors.

Certificates: Provide certificate from manufacturer stating compliance with these specifications.

Guarantee: Provide guarantee for life of installation. Any defects noted during warranty period shall be corrected at no cost to the building Owner. Such corrective work shall include all labor and material for repair, replacement, refinishing and rehanging as required.

PRODUCT HANDLING:

Storage: Store doors at site so as to raise edges off floor and away from walls, letting air circulate freely. Store in enclosed area free from excessive heat, cold and humidity. Do not install scratched, dented or otherwise damaged doors in work.

Packaging: Door Manufacturer shall package doors in a manner to provide protection until they are installed.

Coordination: Provide Door Manufacturer with following:

- Two (2) copies of approved door schedule and Shop Drawings.
- Two (2) copies of the approved hardware schedule.
- One (1) copy of floor plan of building, showing Architect's marks and opening identification.
- Two (2) sets of templates for applicable locks, hinges and other finish hardware.

PART 2: PRODUCTS

SOLID CORE DOORS:

Construction: Doors shall be flush type, solid core, 5-ply, Premium Grade, Type PC-5ME. Seven-ply and non-bonded core construction not accepted. Doors shall be 1-3/4" thick and shall be widths and height shown on door schedule.

Veneer: Face veneer to be plain sliced red oak, "A" grade, book and running matched, factory finished.

Finish: Doors to be factory stained and prefinished, delivered to job in protective wrapping. No doors shall be hung until finish work is complete.

Top and bottom rails shall be factory sealed with an approved sealer.

Core shall be of one piece slab, particle board, density 28-32 lb. per cu. ft. or greater bonded to stiles and rails with Type II adhesive, using high frequency method, then sanded as a unit. Meet particleboard standard ANSI A208.1, Grade 1-LD-2.

Vertical stiles shall be two piece 1 3/8" thick, with an inner stile of SCL laminated to outer 1/4" hardwood stile, matching the veneer, to provide minimum thickness after trimming of 1 3/8". Top and bottom rails shall be of structural composite lumber (SCL) construction 1 3/8" thick before prefitting. Blocking shall be provided where mortise closers or other similar devices occur.

Composite cross bands shall be applied to core prior to application of matching hardwood stiles. Exposed cross banding is not allowed along stile edges.

Veneers are to be applied to the cross banded core in a HOT PRESS using Type I exterior water resistant adhesive. Five ply construction. Exposed veneer edges are not permitted.

Openings: Factory cut openings for glass. Flush wood glass stops required for non-rated openings, species to match veneer. 20 minute rated glass kits will utilize concealed metal glass retaining clips equal or similar to VT Industries VT Fire Clip.

Glass: 1/4" tempered or wire glass will be furnished and installed under Section 08800.

COMPOSITE FIRE DOORS:

Grade: WDMA I.S. 1-A, Premium, Type FD-5

Construction shall conform to Underwriter's Laboratories Class "B" 1 Hr. and 1-1/2 Hr. and Class "C" 3/4 Hr. rating requirements and shall have been tested in accordance with ASTM E 152 for fire resistance, heat transmission, and structural integrity.

Core: Core shall be calcium silicate with non-asbestos fibers, 30.8 – 34.7 lbs./ft³ nominal density, containing no asbestos. Core shall be jointed together with tongue-and-groove joints in accordance with Underwriter's Laboratories, Inc. procedure manual. Core shall be smoothly sanded prior to application of cross band and face veneer.

Edge Bands: Outer stiles are to be of same species as veneer. Inner stiles to be structural composite lumber (SCL) for 45 minute rated doors, or GP Firestop I for 60 and 90 minute rated doors which can be warranted for use with mortise butt hinges and No. 12 – 1 1/4" steel threaded-to-head screws. The door manufacturer shall drill 5/32" diameter pilot holes for all hinges.

Rails are to be structural composite lumber (SCL) for 45 minute rated doors, or GP Firestop for 60 and 90 minute rated doors, manufacturer's standard width.

Composite cross bands shall be applied to core prior to application of matching hardwood stiles. Exposed edge banding is not allowed along stile edges.

Veneers are to be applied to the cross banded core in a HOT PRESS using Type I exterior water resistant adhesive. Five ply construction. Exposed veneer edges are not permitted.

Where UBC 7-2-1997 requirements for positive pressure must be met, doors shall include all requirements as part of the door construction per "Category A" guidelines as published by ITS/Warnock Hersey. No intumescent is allowed on the frame. Only smoke gasketing applied around the perimeter of the frame to meet the "S" rating is permissible.

Vision panels and glass lights where indicated on plans, furnish and install vision panels glazed with 1/4" tempered or wire glass as indicated. Glass stops will be flush type and will utilize concealed metal glass retaining clips equal or similar to VT Industries VT Fire Clip. Where UBC 7-2-1997 requirements for positive pressure must be met, install a light kit labeled for UBC 7-2-1997 positive pressure applications to meet the appropriate fire rating.

Astragal sets, metal edges, or edge guards will not be allowed on positive pressure doors concealing intumescent within door structure.

FACTORY FINISHING:

AWI, catalyzed polyurethane, premium grade. Stain coat, three coats of sealer, two polyurethane topcoats finish per AWI Section 1500. AWI Types 2 and 3 are not acceptable.

Top and bottom rails shall be factory sealed.

HARDWARE PREPARATION:

Machining: Doors shall be factory machined for application of finish hardware that required cutting of door (except surface applied hardware) including pilot holes for hinge screws and lock fronts.

Coordination: Door manufacturer shall assume responsibility of properly coordinating hardware schedule, door schedule, and hollow metal frame shop drawings and shall supply machined doors individually identified for proper openings.

LOCATION OF HARDWARE: Refer to Section 08700.

PART 3: EXECUTION

CONDITION OF SURFACES:

Frames shall be set plumb and secure before installation of doors.

Responsibility: Contractor will be held responsible for correct door frame installation. Frames out of square, cocked at bottom or bowed in or out along vertical jambs more than 1/8" shall be reinstalled.

Temperature and Humidity: Doors shall not be installed until areas of installation have temperature and humidity near that of completed building.

DOOR INSTALLATION:

Fire door installation is required to be in accordance with the NFPA 80, "Standard for Fire Doors and Fire Windows". Machined fire doors shall be provided with detailed installation instructions when doors bear a label indicating compliance to UBC 7-2-1997 or UL 10C.

Hanging: Doors shall be fitted, hung plumb, and true to within following allowable warpage tolerances: 1/4" for doors of areas 10 sq. ft. or greater, 1/8" for doors under area of 10 sq. ft. Install fire doors in accordance with NFPA Pamphlet 80 1-11.4, 1999 edition and U.L. requirements.

Non-rated clearances: Provide clearances of 1/8" at sides and top; lock edge shall have required bevel to clear frame. Provide at bottom, for specific locations, minimum adequate clearance of finish floor coverings and/or thresholds, not to exceed 3/4". Provide other undercuts as required.

Category "A" clearances between door edge and frame must be at least 1/16" and no greater than 1/8" at the head and jambs. See NFPA 80 1-11.4, 1999 edition, for clearance under door bottoms.

Factory machined doors improperly sized for opening or improperly machined for hardware by Door Manufacturer shall be rejected and returned to factory for proper replacement.

GLAZING:

Set glass against fixed molding with specific glazing compound utilizing glass retaining clips as specified.

END OF SECTION

PART 1: GENERAL

RELATED DOCUMENTS

Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work in this section.

DESCRIPTION OF WORK

The extent of each type of door and frame is shown on the drawings and schedules.

The following types of doors and frames are required:

1. FRP flush doors
2. Aluminum Heavy-Duty Screen Door
3. Aluminum frames
4. FRP panels
5. Insert frames
6. Frame capping systems
7. Door hardware

SYSTEM PERFORMANCE

Provide door assemblies that have been designed and fabricated to comply with requirements for system performance characteristics listed below, as demonstrated by testing manufacturer's corresponding standard systems according to test methods designated.

Thermal Transmission (exterior doors): "U" value of not more than 0.09 (BTU/Hr. x sf x degrees F.) per AAMA 1503.01.

Flame Spread/Smoke Developed: Provide FRP doors and panels with the following ratings in according with ASTM E 84-79a: Flame Spread: Not greater than 170 (Class C). Smoke Developed: Not greater than 390 (Class C).

Class A option for flame spread and smoke developed rating on interior faces of exterior panels and both faces of interior panel as shown. Flame spread no greater than 15, smoke developed no greater than 310 per ASTM E-84.

Additional Criteria: Provide FRP doors and panels with the following performance: ASTM D 256 \bar{D} nominal value of 20.0 ASTM D 570 \bar{D} nominal value of .20 to .40% ASTM D 2583 \bar{D} nominal value of 50

Abrasion Resistance: Face sheet to have no greater than .029 average weight loss percentage after Taber Abrasion Test \bar{D} 25 cycles at 500 gram weight with H-18 wheel.

Stain Resistance: Face sheet to be unaffected after 24 hour exposure to SVS-1 white spray enamel. Must retain DE of .57 or less with MacBeth Colorimeter. Dark Brown (Bronze) FRP to be used as a basis.

Chemical Resistance: Face sheet to be unaffected after 4 hour exposure to acetic acid (10% solution), acetone, sodium hypochlorite (5.25% solution) and hydrochloric acid (10% solution). No discoloration or panel damage will be allowed.

QUALITY ASSURANCE

Standards: Comply with the requirements and recommendations in applicable specification and standards by AAMA, except to the extent more stringent requirements are indicated.

Performance: A minimum ten (10) year record of production of frames, doors and panels and completion of similar projects in type and size.

Instruction: The manufacturer or his representative will be available for consultation to all parties engaged in the project including instruction to installation personnel.

Field Measurement: Field verify all information prior to fabrication and furnishing of materials. Furnish and install materials omitted due to lack of verification at no additional cost to owner.

Regulation and Codes: Comply with the current edition in force at the project location of all local, state and federal codes and regulations, including the Americans with Disabilities Act of 1992.

SUBMITTALS

Product Data: Submit Manufacturers product data, specifications and instructions for each type of door and frame required in accordance with Section 01340 and the following:

1. Include details of core, stile and rail construction, trim for lites and all other components.
2. Include details of finish hardware mounting.
3. Include samples of each aluminum alloy to be used on this project. Where normal finish color and texture variations are expected, include two or more samples to show the range of such variations.
4. Include one sample of typical fabricated section, showing joints, fastenings, quality of workmanship, hardware and accessory items before fabrication of the work proceeds.

Submit shop drawings for the fabrication and installation of the doors and frames, and associated components. Details to be shown full scale. Include glazing details and finish hardware schedule.

PRODUCT DELIVERY, STORAGE AND HANDLING

Deliver materials to job site in their original, unopened packages with labels intact. Inspect materials for damage and advise manufacturer immediately of any unsatisfactory materials.

Package door assemblies in individual corrugated cartons so no portion of the door has contact with the outer shell of the container. Package and ship frames preassembled to the greatest possible extent.

PROJECT GUARANTEE

Provide a written guarantee signed by manufacturer, installer and contractor, agreeing to replace, at no cost to the owner, any doors, frames or factory hardware installation which fail in materials or workmanship, within the guarantee period. Failure of materials or workmanship includes: excessive deflection, faulty operation of entrances, deterioration of finish or construction in excess of normal weathering and defects in hardware installation. The minimum time period of guarantee is ten (10) years from acceptance.

PART 2: PRODUCTS

ACCEPTABLE MANUFACTURERS

Manufacturer: Subject to compliance with requirements, provide products of the following: SL-17 with SpecLite3E as manufactured by Special-Lite, Inc., Decatur, Michigan. Other acceptable manufacturers are:

1. Extrudart Products, Inc.
2. Cline Aluminum Doors, Inc.
3. Other pre-approved manufacturers.

MATERIALS AND ACCESSORIES

Aluminum Members: Alloy and temper as recommended by manufacturer for strength, corrosion resistance and application of required finish and control of color; ASTM B 221 for extrusions, ASTM B 209 for sheet/plate with aluminum wall thickness of 0.1259.

Components: Furnish door and frame components from the same manufacturer.

Splitting of door and frame components is not permitted.

Fasteners: Aluminum, non-magnetic stainless steel or other non-corrosive metal fasteners, guaranteed by the manufacturer to be compatible with the doors, frames, stops, panels, hardware, anchors and other items being fastened. For exposed fasteners (if any) provide Phillips head screws with finish matching the item to be fastened.

Glazing Gaskets: For glazing factory-installed glass, and for gaskets which are factory-installed in Captive assembly of glazing stops, manufacturers standard stripping of molded neoprene, complying with ASTM D 2000 (designation 2BC415 to 3BC620), or molded PVC complying with ASTM C 509 Grade 4

Weather stripping: Manufacturer's standard pile type in replaceable rabbets for stiles; manufacturer's standard EPDM bulb type in doorframes.

Hardware: ADA Compliant:

- a. Provide hardware listed, unless scheduled on Drawings or specified in 08700, for complete assemblies.
- b. Aluminum Threshold: Pemko 2001_T, or equivalent by National Guard or Hager.
- c. Weather stripping – perimeter wool pile: National Guard, Pemko, or Hager.
- d. Continuous door sweep with drip – Pemko 345-V, or equivalent.
- e. Automatic Door Bottoms: Pemko 412_PKL
- f. Push/Pull unless exit device indicated on door schedule.
- g. Closer: LCN 4040XP, with backstop arm and hold-open feature.
- h. Heavy-Duty 3/8" adjustable continuous hinge: Select Products, Pemko, or McKinney.
- i. Removable mullion at pairs of doors: Von Duprin, keyed operation.

FABRICATION

Sizes and Profiles: The required sizes for door and frame units, and profile requirements are shown on the drawings.

Coordination of Fabrication: Field measure before fabrication, and show recorded measurements on final shop drawings.

Complete the cutting, fitting, forming, drilling and grinding of all metal work prior to assembly. Remove burrs from cut edges, and ease edges and corners to a radius of approximately 1 /649.

No welding of doors or frames is acceptable.

Maintain continuity of line and accurate relation of planes and angles. Secure attachments and support at mechanical joints, with hairline fit at contacting members.

FIBERGLASS REINFORCED POLYESTER FRP FLUSH DOORS

Materials and Construction:

1. Construct 1 3 /4" thickness doors of 6063-T5 aluminum alloy stiles and rails minimum 2 5 /169 depth. Construct with mitered corners and provide joinery of 3 /89 diameter full width tie rods through extruded splines top and bottom as standard .1259 tubular shaped stiles and rails reinforced to accept hardware as specified. Provide hex type aircraft nuts for joinery without welds, glues or other methods for securing internal door extrusions. Furnish integral reglets to accept face sheet to permit a flush appearance. Rail caps or other face sheet capture methods are not acceptable.
2. Extrude top and bottom rail legs for interlocking continuous rigidity weather bar. Lock face sheet material in place with extruded interlocking edges to be flush with aluminum stiles and rails.
3. Door face sheeting: .1209 thickness fiberglass reinforced polyester. SL-17 doors with an abuse resistant engineered surface of the standard colors: to be selected from manufacturers standard selection, minimum selection as follows: white, light gray, red, blue, green, beige, dark gray, dark bronze, black.
4. Core of Door Assembly: Minimum five pounds per cubic foot density poured-in-place polyurethane free of CFC. Minimum 'R' value of 11. Ballistic rating is as indicated. Meeting stiles on pairs of doors and bottom weather bar with nylon brush weather stripping.
5. Manufacture doors with cutouts for vision lites, louvers or panels as scheduled. Factory furnish and install all glass, louvers and panels prior to shipment.
6. Pre-machine doors in accordance with templates from the specified hardware manufacturers and approved hardware schedule. Factory install hardware.

LOUVERS

Special-Lite inverted 'Y' louver, clear anodized.

ALUMINUM FRAMING SYSTEMS

Tubular Framing:

1. Framing system from the door manufacturer of the size and type shown. .1259 minimum wall thickness and type 6063-T5 aluminum alloy. .6259 high applied doorstops with screws and weather stripping. Frame members are to be box type with four (4) enclosed sides. Open back framing will not be acceptable.
2. Framing members shall include 1/8" solid aluminum bar internal reinforcing at all members.
3. Caulk joints before assembling frame members. Secure joints with fasteners and provide a hairline butt joint appearance. Prefit doors to frame assembly at factory prior to shipment. Field fabrication of framing using Stick material is not acceptable.
4. Applied stops for side, transom and borrowed lites and panels, with fasteners exposed on interior or unsecure portion only. Pre-machine and reinforce frame members for hardware in accordance with manufacturer's standards and the approved hardware schedule.
5. Install with anchors appropriate for wall conditions to anchor framing to wall materials. A minimum of five anchors up to 7849 on jamb members, and one additional anchor for each foot over 7849. Secure head and sill members of transom, side lites and similar conditions.
6. Factory pre-assemble side lites to the greatest extent possible, and mark frame assemblies according to location.

Insert Framing Systems:

1. Model: SL-1031, SL-1032 or SL-1034.
2. Insert frame as shown, using an integral stop fitted with weather stripping.
3. Corner joints of miter design, secure with furnished aluminum clips, and screw into place.
4. Reinforce and pre-machine insert frame members for hardware in accordance with manufacturer's standards and the approved hardware schedule.
5. Framing members shall include 1/8" solid aluminum bar internal reinforcing at all members.
6. Anchors of a suitable type to fasten insert framing to existing frame materials, using a minimum of five anchors on jambs up to 7849 height, three on headers. One additional anchor for each additional lineal foot of frame.

Frame Capping:

1. Model: SL-70
2. .0939 wall thickness capping as indicated on drawings with insert frame as shown. Finish of capping to match framing.

GLAZING

Design system for Replacement of Glass:

1. Manufacturers standard flush glazing system of recessed channels and captive glazing gaskets or applied stops as shown.

2. Allow for thermal expansion on exterior units.
3. Glass as shown and factory glazed into doors.

Security Grate Option: Security grate model SL-349 as manufactured by Special-Lite, Inc., Decatur, Michigan.

Aluminum Screen Doors: Series 400SE Heavy-Duty Screen Door by Cline Aluminum Doors, Inc.

ALUMINUM FINISHES

Anodized Surfaces: Clear, Class I, 0.7 mils.

PART 3: EXECUTION

INSTALLATION

Comply with manufacturers recommendations and specifications for the installation of the doors and frames. Factory install hardware, glass and louvers in doors. Factory assemble side lites and transoms to the greatest extent possible.

Set units plumb, level and true to line, without warp or rack of doors or frames. Anchor securely in place. Separate aluminum and other metal surfaces with bituminous coatings or other means as approved by architect.

Set thresholds in a bed of mastic and backseal.

Clean surfaces promptly after installation of doors and frames, exercising care to avoid damage to the protective coatings.

Ensure that the doors and frames will be without damage or deterioration (other than normal weathering) at the time of acceptance.

Provide owner with all adjustment tools and instruction sheets. Arrange an inservice session to owner at owner's convenience. Provide a minimum one-year written guarantee on all labor related to this section. Any workmanship, which is defective or deficient, shall be corrected to the owner's satisfaction and at no additional cost to the owner.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. OfficeSlide™ Barn (Sliding) Doors - flush wood, aluminum frames and related hardware.

1.2 RELATED SECTION

- A. Section 08200 – Flush Wood Door

1.3 SUBMITTALS

- A. Comply with Section 01 33 00 – Submittal Procedures
- B. Product Data: Submit manufacturer's product data, including installation instructions.
- C. Shop Drawings: Submit manufacturer's shop drawings, including plans, elevations, sections, and details, indicating dimensions, tolerances, materials, components, hardware, finish, options, and accessories. Shop Drawings to show required blocking by others.
- D. Samples: Submit manufacturer's samples of the following sliding door components:
 - 1. Door veneer or laminate sample
 - 2. Aluminum Frame finish sample
- E. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.
- F. Warranty Documentation: Submit manufacturer's standard warranty.
- G. Test Reports: Submit acoustical reports or UL1784 as applicable.

1.4 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of interior aluminum frames and doors.
- B. Source: Obtain sliding aluminum framed doors and hardware from single source.
- C. Manufacturer's Qualifications: Manufacturer regularly engaged for past 5 years in manufacture of sliding doors similar to that specified.

1.5 REFERENCES

- A. ANSI – American National Standards Institute
 - 1. ANSI 156.18 Materials and Finishes
 - 2. ANSI A117.1 Specifications for making buildings and facilities usable by physically handicapped people.

- B. BHMA – Builders Hardware Manufacturers Association
- C. DHI – Door and Hardware Institute
- D. NFPA – National Fire Protection Association
 - 1. NFPA 80 – Fire Doors and Windows
 - 2. NFPA 101 – Life Safety code
 - 3. NFPA 105 – Smoke and Draft Control Door Assemblies
 - 4. NFPA 252 – Fire Tests of Doors Assemblies
- E. AWS – Architectural Woodwork Standards

1.6 PERFORMANCE

- A. Aluminum perimeter frames with integral acoustic seals
- B. Soft self-closing mechanism integrated with top track
- C. Concealed door guide

1.7 DELIVERY: STORAGE AND PROTECTION

- A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Notify manufacturer immediately of any shipping damage.
- C. Storage and Handling Requirements:
 - 1. Store and handle materials in accordance with manufacturer's instructions.
 - 2. Keep materials in manufacturer's original, unopened containers and packaging until installation.
 - 3. Store materials in clean, dry area indoors.
 - 4. Protect materials and finish during storage, handling, and installation to prevent damage.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. **AD SYSTEMS** 2201 100th St. SW, Everett, WA 98204 | Website: <http://specADsystems.com>
| Phone: 425-374-1360 | Attn: Estimating: estimating@specADsystems.com

2.2 INTERIOR SLIDING ALUMINUM-FRAMED DOORS AND PARTITIONS

- A. Interior Aluminum-Framed Top-Hung Sliding Doors: Model: OfficeSlide™ High Performance Barn (Sliding) Door System by AD Systems

- B. Frame Profiles: Extruded aluminum frame "wrap" frame with integral vertical jamb (stile pocket).
 - 1. Finish:
 - a. Standard: Painted Hardcoat Kynar Finish. Meets AAMA 2604 Standard Colors: Architect to choose from standard colors.
- C. Door Leafs. All Doors to be factory machined for hardware including pilot and function holes.
 - 1. 1-3/4" Flush Red Oak Wood Door: Reference Spec Section 08200 Wood Doors. Solid Particle Core Red Oak veneer species, with factory finish.
- D. Door Components:
 - 1. Single Top Track: AD Systems extruded aluminum track by AD Systems
 - 2. Valances: Extruded aluminum with integral end caps
 - a. [Standard square valance]
 - 3. Top Rollers: tandem nylon roller sized to match door weight
 - 4. Concealed Floor Guide: Integral Jamb floor guide by AD Systems
 - 5. Soft-Closer: Soft and self-closing damper mechanism at one side of door leaf
 - 6. Handles:
 - a. AD Systems Standard Straight Pull: 12" long x 1" diameter. Finish: US32D Satin Stainless Steel]
- E. Accessories:
 - 1. Door Locks:
 - a. Not Required

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine wall openings to receive sliding doors for plumb, level, and square. Note: Finish door operation will be affected by out of tolerance framing.
- B. Verify dimensions of wall openings.
- C. Examine surfaces to receive top and bottom guide.
- D. Notify Architect of conditions that would adversely affect installation or subsequent use of sliding doors.
- E. Do not begin installation until unacceptable conditions are corrected.
- F. Base of door side to be flush or minimal. Rubber Base acceptable.

3.2 INSTALLATION

- A. Install sliding doors in accordance with manufacturer's instructions at locations indicated on the Drawings.
- B. Install sliding doors plumb, level, square, and in proper alignment.
- C. Install sliding doors to close against walls without gaps
- D. Install sliding doors to open and close smoothly.
- E. Anchor sliding doors securely in place to supports. Required: Fire treated 2 x 6 blocking required full length of track.

3.3 ADJUSTING

- A. Adjust sliding doors for proper operation in accordance with manufacturer's instructions.
- B. Adjust sliding doors to operate smoothly without binding.
- C. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.

3.4 CLEANING

- A. Clean sliding doors promptly after installation in accordance with manufacturer's instructions.
- B. Do not use harsh cleaning materials or methods that could damage materials or finish.

3.5 PROTECTION

- A. Protect installed sliding doors from damage during construction.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

1.01 SUMMARY

A. Section Includes: Aluminum Storefront Systems

1. YKK AP Series YES 45F-T MegaTherm™ Storefront System 2" x 4 ½".

B. Related Sections:

1. Sealants: Refer to Division 7 Joint Treatment Section for sealant requirements.
1. FRP Doors and Frames Section 08210
2. Glass and Glazing: Refer to Division 8 Glass and Glazing Section for glass, glazing and insulated panel requirements.

1.02 SYSTEM DESCRIPTION

A. Performance Requirements: Provide aluminum storefront systems that comply with performance requirements indicated, as demonstrated by testing manufacturer's assemblies in accordance with test method indicated.

1. Wind Loads: Completed storefront system shall withstand wind pressure loads normal to wall plane indicated:
 - a. Exterior Walls:
 1. Positive Pressure:
 2. Negative Pressure:
 - b. Interior Walls (Pressure Acting in Either Direction):
2. Deflection: Maximum allowable deflection in any member when tested in accordance with ASTM E 330-84 with allowable stress in accordance with AA Specifications for Aluminum Structures.
 - a. Without Horizontals: L/175 or 3/4" (19.1mm) maximum.
 - b. With Horizontals: L/175 or L/240 + 1/4" (6.4mm) for spans greater than 13'-6" (4.1m) but less than 40'-0" (12.2m).
3. Thermal Movement: Provide for thermal movement caused by 180 degrees F. (82.2 degrees C.) surface temperature, without causing buckling stresses on glass, joint seal failure, undue stress on structural elements, damaging loads on fasteners, reduction of performance, or detrimental effects.

4. Air Infiltration: Completed storefront systems shall have 0.00 CFM/FT² (0.00 m³/h·m²) maximum allowable infiltration when tested in accordance with ASTM E 283-84 at differential static pressure of 6.24 PSF (299 Pa).
5. Water Infiltration: No uncontrolled water on indoor face of any component when tested in accordance with ASTM E 331-86 at a static pressure of 15 PSF (718 Pa).
6. Watertight Installations: Field Tested in accordance with AAMA 501.2-03.
7. Thermal Performance: When tested in accordance with AAMA 1503.1-88 Condensation Resistance Factor (CRF), and ASTM C 236-89 Thermal Transmittance (U Value) as follows:
 - a. CRF: A minimum of 59.
 - b. U Value: 0.58 BTU/HR/FT²/°F or less.

1.03 SUBMITTALS

- A. General: Prepare, review, approve, and submit specified submittals in accordance with "Conditions of the Contract" and Division 1 Submittals Sections. Product data, shop drawings, samples, and similar submittals are defined in "Conditions of the Contract."
- B. Product Data: Submit product data for each type storefront series specified.
- C. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including anchorage, accessories, finish colors and textures.
- D. Samples: Submit verification samples for colors on actual aluminum substrates indicating full color range expected in installed system.
 1. Typical framing member, with reinforcing
 2. Bent plate aluminum sill pan
- E. Quality Assurance / Control Submittals:
 1. Test Reports: Submit certified test reports showing compliance with specified performance characteristics and physical properties.
 2. Installer Qualification Data: Submit installer qualification data.
- F. Closeout Submittals:
 1. Warranty: Submit warranty documents specified herein.
 2. Project Record Documents: Submit project record documents for installed materials in accordance with Division 1 Project Closeout (Project Record Documents) Section.

1.04 QUALITY ASSURANCE

- A. Qualifications:
 1. Installer Qualifications: Installer experienced (as determined by contractor) to perform work of this section who has specialized in the installation of work similar to that

required for this project. If requested by Owner, submit reference list of completed projects.

2. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction, approving acceptable installer and approving application method.
- B. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.
- C. Mock-Ups (Field Constructed): Install at project site a job mock-up using acceptable products and manufacturer approved installation methods. Obtain Owner's and Architect's acceptance of finish color, and workmanship standard.
- D. Maintenance: Maintain mock-up during construction for workmanship comparison; remove and legal dispose of mock-up when no longer required.
- E. Incorporation: Mock-up may be incorporated into final construction upon Owner's approval.
- F. Field Test: Conduct field test to determine water-tightness of storefront system. Conduct test in accordance with AAMA 501.2-03 at locations selected by Architect.

1.05 PROJECT CONDITIONS / SITE CONDITIONS

- A. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

1.06 WARRANTY

- A. Project Warranty: Refer to "Conditions of the Contract" for project warranty provisions.
- B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under the Contract Documents.
 1. Beneficiary: Issue warranty in the legal name of the project Owner.
 2. Warranty Period: 5 years commencing on Date of Substantial Completion
 3. Warranty Acceptance: Owner is sole authority who will determine acceptability of manufacturer's warranty documents.
 4. Anodized Finish Warranty: 10-year warranty commencing on Date of Substantial Completion.

PART: 2 PRODUCTS

2.01 MANUFACTURERS (Acceptable Manufacturers/Products)

- A. Acceptable Manufacturers:

YKK AP America Inc., Austell, GA 30168, Telephone: (678) 838-6000

1. Storefront System: YKK AP YES 45F-T MegaTherm™ Storefront System.

Vistawall Series 3000-S
US Aluminum Series IT 451

B. Storefront Framing System:

1. Description: Center set, exterior flush glazed; jambs and vertical mullions continuous; head, sill, intermediate horizontal attached by screw spline joinery.
2. Components: Manufacturer's standard extruded aluminum mullions, 0-15 degree hinged mullions, 90 degree corner posts, flexible corner posts, three-way corner posts, entrance door framing, and indicated shapes.
3. Thermal Barrier: Provide continuous thermal barrier by means of 6/6 nylon polyamide glass fiber reinforced pressure extruded bars. Systems employing non-structural thermal barriers are not acceptable.
4. Provide .125" thick aluminum bent plate sill pan with end dams at exterior storefront systems. Profiles, sizes and shape as indicated on Drawings.
5. Doorstops to be integral fin type, snap-in type not acceptable.
6. Provide internal frame reinforcements all closer locations.
7. Provide 1/8" internal frame reinforcements at all FRP door entrance insert framing.
8. Provide steel internal frame reinforcements at all framing, sized as required to meet wind loading conditions.

2.02 MATERIALS

A. Extrusions: ASTM B 221 (ASTM B 221M), 6063-T5 Aluminum Alloy.

B. Aluminum Sheet:

1. Anodized Finish: ASTM B 209 (ASTM B 209M), 5005-H14 Aluminum Alloy, 0.050 inch (1.27 mm) minimum thickness.
2. Painted Finish: ASTM B 209 (ASTM B 209M), 3003-H14 Aluminum Alloy, 0.080 inch (1.95 mm) minimum thickness.

2.03 ACCESSORIES

A. Manufacturer's Standard Accessories:

1. Fasteners: Zinc plated steel concealed fasteners; Hardened aluminum alloys or AISI 300 series stainless steel exposed fasteners, countersunk, finish to match aluminum color.
2. Sealant: Non-skinning type, AAMA 803.3

3. Glazing: Setting blocks, edge blocks, and spacers in accordance with ASTM C 864, shore durometer hardness as recommended by manufacturer; Glazing gaskets in accordance with ASTM C 864.

2.04 RELATED MATERIALS (Specified In Other Sections)

- A. Glass: Refer to Division 8 Glass and Glazing Section for glass materials.
- B. Metal Window Panels: Refer to Division 8 Glass and Glazing Section for metal panel materials.

2.05 FABRICATION

- A. Shop Assembly: Fabricate and assemble units with joints only at intersection of aluminum members with hairline joints; rigidly secure, and sealed in accordance with manufacturer's recommendations.
- B. Fabrication Tolerance:
 1. Material Cuts: Square to 1/32 inch (0.8 mm) off square, over largest dimension; proportionate amount of 1/32 inch (0.8 mm) on the two dimensions.
 2. Maximum Offset: 1/64 inch (0.4 mm) in alignment between two consecutive members in line, end to end.
 3. Maximum Offset: 1/64 inch (0.4 mm) between framing members at glazing pocket corners.
 4. Joints (Between adjacent members in same assembly): Hairline and square to adjacent member.
 5. Variation (In squaring diagonals for doors and fabricated assemblies): 1/16 inch (1.6 mm).
 6. Flatness (For doors and fabricated assemblies): +/- 1/16 inch (1.8 mm) off neutral plane.

2.06 FINISHES AND COLORS

- A. Anodized Finish: YKK AP AMERICA Anodized Finish
 1. Clear anodized finish, with clear protective composite coating.
- B. Finishing: Prepare aluminum surfaces for specified finish; apply finish in accordance with the following:
 1. Anodized Coating: Electrolytic color coating followed by an organic top coating applied to aluminum extrusions produced from quality-controlled billets meeting AA-6063-T5.
 - a. Exposed surfaces shall be free of scratches and other serious blemishes.
 - b. Extrusion shall be given a caustic etch followed by an anodic oxide treatment and sealed with an organic electrodeposition applied protective top coating.
 - c. Overall coating thickness for finishes shall be a minimum of 0.7 mils.

- d. Coating shall conform to Aluminum Association Standard AAM12C22A4X. A4X designation shall signify an anodic coating of 0.4 mils minimum followed by an organic top coating of a minimum 0.3 mils.
 - e. In addition to the Aluminum Association Standard above, finish shall conform to the following:
 - i. AAMA 605.2 Mortar Resistance Test Specification; Test Method per ASTM C207, 24 Hour Pat Test.
 - ii. CASS Corrosion Resistance Test. CASS 240/ASTM B368 Test Method.
 - iii. Other AAMA 605.2 Performance Tests specified in these specifications, such as: 7.3 Dry Film; 7.8.2 Salt Spray Resistance; 7.9.1.2 Color Retention, South Florida; 7.9.1.4 Gloss Retention, South Florida.
- C. Finishes Testing:
- 1. Apply 0.5% solution NaOH, sodium hydroxide, to small area of finished sample area; leave in place for sixty minutes; lightly wipe off NaOH; Do not clean area further.
 - 2. Submit samples with test area noted on each sample.
- D. Anodized Finish Warranty: 10-year warranty commencing on Date of Substantial Completion.

PART 3: EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS / RECOMMENDATIONS

- A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions, and product carton instructions.

3.02 EXAMINATION

- A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions.

3.03 PREPARATION

- A. Adjacent Surfaces Protection: Protect adjacent work areas and finish surfaces from damage during product installation.

3.04 INSTALLATION

- A. General: Install manufacturer's system in accordance with shop drawings, and within specified tolerances.
 - 1. Protect aluminum members in contact with masonry, steel, concrete, or dissimilar materials using nylon pads or bituminous coating.
 - 2. Shim and brace aluminum system before anchoring to structure.

3. Walls of storefront framing shall incorporate necessary steel reinforcing.
4. Provide .125" bent plate aluminum sill pans with end dams at exterior storefront systems. Provide profiles, sizes and shape as indicated on Drawings. Extend sill pans continuous with spliced joints; set in continuous beds of waterproofing sealant.
5. Verify storefront system allows water entering system to be collected in gutters and weeped to exterior. Verify weep holes are open, and metal joints are sealed in accordance with manufacturer's installation instructions.
6. Seal metal-to-metal storefront system joints using sealant recommended by system manufacturer.
7. All installation hardware and accessories required for a secure installation into rough openings, including shims, plates and anchors as necessary.

3.05 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Upon Owner's request, provide manufacturer's field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer's instructions.
- B. Field Test: Conduct field test to determine water-tightness of curtain wall system. Conduct test in accordance with AAMA 501.2-03 at locations selected by Architect.
- C. Perform minimum of three tests on various areas as determined by the Architect's representative. Perform test in Architect's presence. Field test first panels completed, then test all panels thereafter upon completion of all fixed panels. Generate and issue test report in compliance with AAMA 501.2-03 requirements.

3.06 ADJUSTING AND CLEANING

- A. Adjusting: Adjust operating items as recommended by manufacturer.
- B. Cleaning: The General Contractor shall clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance, and remove construction debris from project site. Legally dispose of debris.
- C. Protection: The General Contractor shall protect installed product's finish surfaces from damage during construction.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

DESCRIPTION OF WORK:

Work of this Section shall include all labor, materials, equipment, transportation, tools and storage required for complete installation of all finish hardware shown and scheduled on Drawings and specified herein. Intent of this Specification is to provide complete finishing hardware requirements for entire building project excepting hardware, which is specifically mentioned hereinafter as being furnished by others. Any openings not specifically mentioned herein shall be furnished consistent with hardware specified for similar openings.

Wood doors for Project are pre-fit. Coordinate with wood door manufacturer in furnishing hardware templates and schedules at earliest possible time.

INDUSTRY STANDARDS:

For listing of names of industry standard agencies mentioned by abbreviation in this section refer to Section 01068.

QUALITY ASSURANCE:

Manufacturers: Hardware listed in Hardware Schedule shall be supplied by one of following Manufacturers listed for each item or an equal. To establish quality of hardware required, catalog numbers of Manufacturers listed in Hardware Schedule have been used. Hardware furnished shall be of equal type, design, quality and function as that specified in Hardware Schedule.

Acceptable Manufacturers: Similar items manufactured or furnished by other manufacturers may be submitted for approval, subject to these Specification requirements and written approval received 7 days prior to bid date.

Supplier's Qualifications: Contractor shall select only supplier who has in his employ qualified personnel, who shall manage and coordinate complete hardware contract, and shall also be available to visit Project in order to solve or correct conditions affecting proper hardware installation or adjustment, as required.

SUBMITTALS:

Schedule: Submit Hardware Schedule to Architect in six (6) copies, as promptly as possible, showing quantities, types, catalog numbers and locations of various items of finish hardware required. Submit as specified for shop drawings in accordance with GENERAL CONDITIONS.

Job Completion Instructions: At completion of work turn over to Owner all tools, instructions, and maintenance information for his use in maintaining hardware. Furnish Owner also with two copies of Job Use Finish Hardware Schedule, Key Schedule and Master Bitting List for his permanent records.

PRODUCT HANDLING:

Packing, Marking and Labeling: Deliver hardware to project site in manufacturer's original packages. Each article of hardware shall be neatly wrapped and individually packed in substantial carton or other container, properly marked or labeled to be readily identifiable with Hardware Schedule.

Storage: General Contractor shall furnish secure storage area for delivery by Hardware Supplier of finish hardware and storage of same. General Contractor shall be responsible for shortages due to theft and pilferage.

General Contractor shall provide in storage area adequate counters, shelves, and bins for assembly and grouping of hardware for distribution and installation.

PART 2: PRODUCTS

TYPES, SIZES AND DESCRIPTIONS:

Hardware shall be of types and sizes listed in this Section, applied with fastenings of proper size, quantity and finish.

Templates: Hardware for application on metal shall be made to standard templates. Furnish physical samples or templates, as required to Manufacturer of metal doors and frames for proper manufacturer and application.

Reinforcement: Reinforcing for hardware shall be furnished and installed by Door and Frame Manufacturer.

Modifications to hardware required by reasons of construction characteristics shall be such as to provide same operative or functional features. Modifications to hardware shall be made only with Architect's approval, after consultation with the Owner.

Provide hardware for fire rated openings in compliance with UL, UL 10C-1998, UBC 7-2-1997, NFPA-80 and CFR Part 36 (ADA) guidelines. Provide only hardware, which has been tested and listed by UL for types and sizes of doors scheduled. All hardware shall conform to ADA requirements. These requirements take precedence over any other requirements or specifications of this section.

Category "A" Positive Pressure Installations:

Hardware located above 40" AFF to be listed and labeled in accordance with UBC 7-2-1997 and UL 10C-1998 for use in positive pressure fire rated wood doors.

In order to meet smoke requirements, a smoke seal, listed and labeled for UBC 7-2-1997 Parts 1 and 2 positive pressure installations, must be mounted around the perimeter of the doorframe.

Flat bar type astragals only will be allowed on pairs of doors with fire ratings up to 60 minutes with concealed intumescent inside the door structure.

Door Smoke Seals: Doors in smoke partitions shall meet the requirements for a smoke and draft control assembly tested in accordance with UL 1784 for Smoke, and installed in accordance to NFPA 105-2010 Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives..

Provide strikes with extended lips as necessary.

Provide strike dust boxes within each strike, concealing screw anchors.

Provide doors to loading platforms, boiler and mechanical rooms, stages or platforms, utility stairs, and electrical closets with knurling on inside of lever.

KEYING REQUIREMENTS

All keyed locking devices are to be furnished with Best interchangeable core cylinders.

Furnish all exterior keyed devices with temporary construction cores.

All keyed locking devices to be construction master keyed, and grand master keyed to the Best great grand master key system and keyway as designated and approved by Owner. Provide Keystone 600 keying software system; Keystone 600 Import KS 600 IMP-1 and facility software upgrade KS 600 NDB-1.

Provide 6 keys per cylinder, stamped with keying symbol, to the Owner.

Provide a keying transcript and master bitting list for the project directly to the Owner via e-mail and hard copies via transit.

All permanent keys, permanent control keys, and permanent cores are shipped directly to the hardware supplier from Best, whereupon all materials shall be inventoried and checked for compliance. Upon completion of inventory and compliance check, the hardware supplier will deliver all permanent keys and permanent cores directly to the Owner. The Owner shall retain possession until the proper time for the hardware supplier to install into exterior keyed devices and converting interior construction master keyed devices to the permanent keying system.

The general contractor shall be furnished 5 temporary construction keys and 2 temporary core control keys for the exterior keyed devices.

The general contractor shall be furnished 5 construction master keys for the interior keyed devices and 2 extractor devices used to disable the construction master key system. Note: All construction keys to be turned over to the Owner at same time permanent cores and permanent keying are installed.

Two (2) extractor devices shall be provided to the Owner.

The hardware supplier shall furnish the permanent cores to the Owner, after receipt from Best and completion of inventorying and the compliance check. At the proper time, the hardware supplier is to obtain the permanent cores from the Owner, install them in all exterior keyed devices, and disable the construction master key system for all interior keyed devices using the extractor tool to remove, insert, and turn all cylinders to assure each assigned key works properly.

The general contractor shall hang the key cabinet. The hardware supplier shall set up key cabinet with the Owner's representative and user present, prior to the completion of construction. Key cabinet to be located by the Owner.

Provide 300 key blanks.

Provide a key stamp machine.

Provide a key schedule sorted by key symbol.

Provide a key schedule sorted by door number.

Representatives from the General Contractor, manufacturer, and hardware supplier shall meet with the Architect's representative and Owner's locksmith to receive keying instructions prior to preparing the keying schedule for approval.

The Owner shall be provided a minimum of one (1) key for each miscellaneous device; such as fire extinguisher cabinets, cabinet doors, water hose bibs, light switches, low voltage keyed electrical devices, etc. Where any contract requires a greater quantity, provide the more stringent option.

Owner's Representative: Daren McLean 919-893-4804

Keying is to be as follows:

- A. Keyway: Best Coremax MJ1 keyway (unless otherwise required by Owner)
- B. SKD-1 Principal's Office (6 keys)
SKD-2 Record's Room (6 keys)
SKD-3 Dry Storage in Kitchen (6 keys)
(These keys are not to be keyed to any existing system and stand alone).
- C. Grand Masters: (Key that will open every door on campus except SKD doors. Configured to school system's master plan). (20 keys)
- D. Building Area Masters: (Master key for each separated building area – 100, 200, 300, 400, 500 (6 keys each).
- E. Sub Masters: (All suite-like areas are to have a master key to this area – Media, Admin, Student Services, Band, Cafeteria, and others as specified by Architect). (6 keys each)
- F. Utility Platform and Mechanical Doors including Boiler Room: Keystone 600 J1 keyway, (25 keys).
- G. Keyed Removable Mullions: Keystone 600 Coremax MJ1 keyway
- H. Change Key: (individual door key for every door, 6 keys per cylinder) (not to exceed 6 keys per key set).

HARDWARE ITEMS:

Locksets: Best 9K3 Series Heavy-Duty Grade 1 cylindrical locksets, 14 curved return lever, with D 3 ½" convex wrought rose. Provide Best interchangeable cores for all keyed doors. All cylinders shall be "factory pinned" using original Best pins and Best brass key blanks.

Interior Electronic Access Control Locksets (SCHEDULED INTERIOR DOORS): Schlage NDE Series networked wireless cylindrical lockset, battery operated, with open architecture platform, with multi-technology reader module type (full range of proximity credential and smart credential compatibility). Featuring wireless reporting, wireless controlled, wireless communication. Provide a complete assembly, including but not limited to: wireless communication relays, electrified lock, credential reader, door position sensor, request-to-exit sensors, with keying to match the rest of the project. Lever style to be Sparta lever. Ncontrollers, and gateway communication devices, and panel interface modules (PIM) for the locksets shall be provided by the Access Control System provider.

Exterior Electronic Access Control Locksets (SCHEDULED EXTERIOR DOORS): Schlage AD-400 Series networked wireless lockset, battery operated, with open architecture platform, with multi-technology reader module type (full range of proximity credential and smart credential compatibility, and keypad). Featuring wireless reporting, wireless controlled, wireless communication. Provide a complete assembly, including but not limited to: wireless communication relays, electrified lock, credential reader, request-to-exit and request-to-enter sensors, door position switch, tamper guard, with keying to match the rest of the project. The panel interface modules (PIM) for the locksets shall be provided by the Access Control System provider. Operation and sequence to be interlocked with electric strike/intercom/camera/buzz-in systems. Provide as trim for exit devices where exit device scheduled. Lever style to be Sparta lever.

Electric Strike: Von Duprin 6000 Series, interlocked to control access system and any remote operation locations. Provide power supplies, wiring in required voltages, contactors, and all necessary accessories for a complete assembly. Coordinate operation with Controlled Access System components.

Door Stops: All doors shall be provided with wall stops or overhead stops, to suit condition. For example, doors opening onto millwork or open space shall receive overhead stops. Solid wood blocking to be installed at all gypsum wallboard wall stop locations. Provide floor stops at doors with magnetic hold open devices.

Fire rated openings: All fire rated openings, except classrooms, shall receive closers and ball bearing hinges, whether scheduled or not.

Knox Box: (provided by GC for the building, location to be confirmed by Fire Marshal) 3200 Series KNOX-BOX, surface/recessed mount with hinged door, with UL Listed tamper switches, 1/4" plate steel housing, 1/2" thick steel door with interior gasket seal and stainless steel door hinge. Box and lock UL Listed. Lock has 1/8" thick stainless steel dust cover with tamper seal mounting capability. Lock: UL Listed. Double-action rotating tumblers and hardened steel pins accessed by a biased cut key.

Electronic Combination Lockbox: NuSet Smart-Box Series or equivalent (for use at main gate); wall mounted electronic combination lock box, metal casing for keys, control access via day & time or duration-limited access codes, programmable, access log capable, wall mounted. Accessories include USB drive with software pre-loaded, cable adaptor, 4 lithium batteries. Final location to be determined by Architect, confirmed by Owner.

Coordinators: All door pairs with closers to be provided with coordinator devices as necessary for proper sequential closing operation.

Astragals: Non-fire rated door pair with flush bolts shall receive steel astragal on exterior side edge of the active leaf. Pairs of smoke or fire doors shall receive steel astragals, coordinators, and smoke seals and necessary hardware to meet fire rating designated.

Keyed Removable Mullions: All interior and exterior mullions to be removable with keyed operation, with Best cylinder/cores installed by the general contractor and turned by the hardware supplier.

Hinges: Unless otherwise noted, (3) three butt hinges shall be provided each interior door up to 36" width and 86" height. Unless otherwise noted, (4) four heavy duty hinges shall be provided for all interior doors exceeding 36" width or 86" height.

Provide fire-rated hinges on all fire rated doors.

All exterior door hinges shall be heavy-duty continuous hinges.

All hinges for door pairs between connectors and buildings shall be heavy-duty continuous hinges.

All butt hinges on doors with closers shall be ball bearing type.

View Windows: Provide factory finished metal stops for view windows in fire-rated doors. Wherever doors are equipped with exit devices, view windows shall have concealed / flush glass beads.

Fasteners:

Use through bolted fasteners whenever possible, except where noted specifically otherwise. Install door closers, trim, and exit devices with through bolted anchors.

Hardware to be installed on metal work shall be furnished with machine screws. For interior exposed fasteners on bronze or brass material, use matching color and material for fasteners. For all other exposed fasteners on interior, use stainless steel, except where noted specifically otherwise. Furnish stainless steel screws for all exterior work.

Install fixed locking screw in strike plate for exterior locksets after final adjustments made during 6-Month Service and Adjustment Inspection. Provide confirmation in written 6-Month Service and Adjustment Inspection report.

All Products shall be by the following manufacturers - no exceptions:

Butt Hinges: Hager, HB Ives, McKinney

Heavy Duty Continuous Gear Hinges, all exterior doors, and door pairs between connectors and buildings:
Select Products SL24HD, or equal heavy duty by Markar, Hager or Pemko

Locksets (unless otherwise scheduled): Best Heavy-Duty cylindrical Grade 1 9K3 Series

Exterior Electronic Access Control Locksets: Schlage AD-400 Series – networked wireless, battery operated, with Sparta lever

Interior Electronic Access Control Locksets: Schlage NDE Series – networked wireless cylindrical lockset, battery operated, with Sparta lever

Exit devices: Precision 2100 Series (with dogging KEY, attachment to doors shall be through bolted anchors). Provide model compatible with AD-400 and NDE lockset trim for scheduled doors with all necessary accessories.

Surface Closers: LCN 4040XP Super Smoothee; Closer can mount hinge side, top jamb, or parallel arm (with PA bracket) on either right or left swinging doors. Provide metal covers with set screw anchors, in matching finish. Provide ADA rated features. (attachment to doors shall be through bolted anchors)

Deadbolt Locks: Grade 1 Best deadbolt with thumbturn

Cylinder Cores: Best, all cylinders will be Best Keystone 600 Coremax keyway MJ1 throughout, provided with interchangeable cores

Knox Box: 3200 Series KNOX-BOX

Overhead Stops: Corbin, Checkmate, Glynn-Johnson

Flatgoods: Quality, Baldwin, HB Ives

Thresholds: National Guard, Pemko, Hager.

Push/Pulls: Rockwood Manufacturing, HB Ives, Hager.

Push/Pull Latches: Glynn-Johnson

Stops: Glynn-Johnson, Rockwood Manufacturing, HB Ives.

Flush Bolts: Glynn-Johnson, Rockwood Manufacturing, HB Ives, Hager.

Silencers: Glynn-Johnson, Rockwood Manufacturing, HB Ives.

Kick Plates: Rockwood Manufacturing, HB Ives, Hager.

Automatic Flush Bolts: HB Ives, Rockwood Manufacturing.

Coordinator: HB Ives, Rockwood Manufacturing, Trimco

Weather Strip & Rain Drips: National Guard, Pemko, Hager, Reese

Smoke Perimeter Door Frame Gaskets: Pemko, Hager, Reese

Smoke Door Bottom Sweep: Pemko, Hager, Reese

Door Bottoms: National Guard, Pemko, Hager.

Magnetic Door Holders: LCN SEM 7800 Series, with adjustable extension length.

Group Toilet Magnetic Door Holders: LCN SEM 7800 Series, with adjustable extension length, not connected to Fire Alarm System.

Other items shall be as scheduled.

Materials and Finishes: (All products except closers, thresholds, weatherstripping to have brass or bronze base metal unless otherwise noted). Provide the following hardware material as scheduled in the door schedule:

	<u>Materials</u>	<u>Finishes</u>
Hinges, Outswing Exterior Doors	Stainless Steel	US 32 D
Hinges, Inswing Exterior Doors	Stainless Steel	US 32 D
Hinges, Interior Doors	Steel	US 26 D
Pivots	Satin Chrome Plate	US 26 D
Exit Devices	Satin Chrome Plate	US 26 D
Cylindrical Lock Trim	Satin Chrome Plate	US 26 D
Dead Lock Trim	Satin Chrome Plate	US 26 D
O.H. Holders & Stops	Satin Chrome Plate	US 26 D
Door Stop and Holders	Satin Chrome Plate	US 26 D
Box Strikes	Wrought	Prime
Thresholds	Aluminum	Aluminum
Thresholders	Steel	Galvanized Steel
Weatherstrip	Aluminum	Aluminum
Flatgoods	Stainless	US 32 D

Provide the following hardware material as scheduled in the door schedule:

Hinges with closer	BB 1279	4 ½ x 4 ½
St/Stl hinges with closer	BB 1191	4 ½ x 4 ½
HD hinges with closer	BB 1168	4 ½ x 4 ½
St/Stl HD hinges w closer	BB 1199	4 ½ x 4 ½
Hinges without closer	1279	4 ½ x 4 ½
St/Stl Hinges without closer	1191	4 ½ x 4 ½
Privacy set	L F76	
Staff Toilet Privacy set	L F76	
Passage set	N F75	
Entrance lockset	AB F109	
Office lockset	B F82	
Storeroom lockset	D F86	
Push/Pull latchset	HL6	
Elect Access Control Lock:	Schlage AD-400 Series – wireless (Exterior)	
Elect Access Control Lock:	Schlage NDE Series – wireless (Interior where scheduled)	
Electric Strike:	Von Duprin 6000 Series	
Exit device (interior)	2108 x V4908D, classroom function, vandal resistant trim, all interior locations (FL as req'd)	
Exit device (exterior)	2103 x 1703A, x dummy trim scheduled exterior doors – provide 5 dogging keys per opening, delivered to Owner. Dummy trim pull right side only on pairs of doors.	
Exit device (exterior)	2101 x 1701, exit only with cover plate, where scheduled	

Exit device (exterior)	21 x AD-400 trim at scheduled exterior doors
Keyed Removable Mullion Cylinder	KR4954, KR9954 as required (all door pairs throughout)
Exterior Closer	4040XP Super Smoothee – CUSH – HOLD OPEN – AL, non-handed, backstop where scheduled
Interior Closer	4040XP Super Smoothee – EDA – AL, non-handed, backstop where scheduled
Kickplate	1935 8 x 2 LDW
Wall stop	232 W
Floor stop	241 F
Overhead stop	9-331
Flush bolts	282 D, with astragal and top and bottom plungers and dust covers
Threshold	Pemko 2001_T
Automatic Door Bottoms:	Pemko 412_PKL
Upper rain drip	Reese R201C
Lower rain drip/sweep	Pemko 345_V
Weatherstripping	880 S
Frame Smoke Gasket	Pemko 332CR
Door Bottom Smoke Sweep	Pemko 307AV
Push plate	70C 4 x 16
Pull handle	107 x 70C 4 x 16
Key cabinet	Lund Equipment, Telkee, provide cabinet with 350 key capacity, expandable to 700 capacity; Model 1205

PART 3 - EXECUTION

GENERAL:

Consult project drawings and details and otherwise become familiarized with work so that all items furnished will conform to openings to which applied.

Coordinate hardware with other allied trades such as carpentry, millwork, metal frames, etc.

Prepare and submit to Architect for approval as promptly as possible three (3) copies of completed detailed schedule.

Immediately after award of hardware contract, request approved shop drawings from such trades with which hardware must be coordinated.

After checking approved shop drawings, supply promptly such template information, template drawings, approved hardware schedule, etc., as may be required to facilitate progress on job.

PRE-INSTALLATION CONFERENCE AND TRAINING:

Prior to installation of any hardware, conduct pre-installation conference with Architect representative, Owner representative, hardware distributor representative, and installation crew members to verify installation and adjustment techniques and directions. Installation personnel shall be currently certified by Allegion for LCN door closer and Von Duprin exit device installation and adjustment. Allegion will provide and conduct mandatory training courses for installers.

APPLICATION:

Apply hardware in accordance with approved Shop Drawings, with fastenings of proper size, quantity, and finish, and in accordance with Manufacturer's instructions coordinate.

All exit devices, trim, and door closers to be attached with throughbolted anchors.

Operation: All items of hardware shall fit and operate properly.

HARDWARE LOCATIONS:

Door Pulls: 42" from finished floor to center of grip.

Push-Pull Bar: 42" from finished floor to center of bar of center between bars and combination.

Top Hinge: To frame Manufacturer's standard, but not greater than 10" from head of frame to centerline of hinge.

Bottom Hinge: To frame Manufacturer's standard but not greater than 12-1/2" from finished floor to centerline of hinge.

Intermediate Hinges: Equally spaced between top and bottom hinge.

Locks and Latches: 38" from finished floor to center of knob.

Deadlocks (with separate latch-set and/or pull): 48" from finished floor to centerline of strike.

Locate pivots in accordance with Pivot Manufacturer's requirements.

FINAL INSPECTION: After installation of all finish hardware is completed, and before building is accepted, General Contractor shall have capable representative of hardware manufacturers, minimum of an AHC, visit building to inspect and approve installation; to make all necessary adjustments; and to carefully instruct Owner in proper use, servicing, adjusting and maintaining of hardware.

SIX MONTH SERVICE AND REPORT: Six months after acceptance of each area of the project, readjust each item of hardware and restore to proper function. Install fixed locking screw in strike plate for exterior locksets after final adjustments made during 6-Month Service and Adjustment Inspection, and include confirmation statement in the written report. Conduct walk through with Owner regarding recommended additions or modifications to maintenance procedures. Clean and lubricate as required. Replace items, which have deteriorated or failed due to faulty design, materials, or installation. Provide Architect with written report upon completion of above, with list of attendees.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

SUMMARY:

Provide glass and glazing and special fire glass as indicated below, complete.

Work Included This Section:

Glass and Glazing For:

- Aluminum Entrances
- Steel and Wood Doors
- View Windows and Panels
- Curtain Walls
- Exterior Windows
- Special fire glass, frames and doors

INDUSTRY STANDARDS:

For listing of names of industry standard agencies mentioned by abbreviation in this Section refer to Section 01068.

QUALITY ASSURANCE:

Provide safety glass (tempered, laminated, impact resistant) as required by the IBC Code, and complying with requirements of ANSI Z97.1 - American National Standard for Glazing Materials Used in Buildings -- Safety Performance Specifications and Method of Test.

Label each piece of glass designating type and thickness of glass. Do not remove label prior to installation.

Permanently identify each unit of tempered glass. Etch or ceramic fire identification on glass; identification shall be visible when unit is glazed.

Warranty: Provide manufacturer's standard 10 year warranty, including include replacement of sealed glass units exhibiting seal failure or leakage, interpane dusting or misting.

Manufacturers:

Standard: For purposes of designating type and quality for work under this Section, Drawings and Specifications are based on products manufactured or furnished by following manufacturers:

- American St. Gobain Corporation

- Libby-Owens-Ford Glass Company
- Mississippi Glass Company
- Pittsburg Plate Glass Company
- Technical Glass Products
- Nippon Electric Glass Co., Ltd.
- Pilkington

SUBMITTALS:

Glass and Glazing: Submit samples of each type of glass, glazing compound, sealant and tapes for Architect's approval.

Product Data: Submit copy of manufacturer's specifications and installation instructions for each type of glass and glazing material. Include test data or certification substantiating that glass complies with specified requirements and manufacturer's warranties.

Submit manufacturer's standard 10 year warranty for insulated glass units.

MANUFACTURER'S LABELS:

Labels showing Glass Manufacturer's identity, type of glass, thickness and quality will be required on each piece of glass. Labels must remain on glass until it has been set and inspected.

Containers: All glazing compounds shall arrive at project site in unopened, labeled containers.

PRODUCT HANDLING:

Sizes of glass indicated on Drawings are approximately only. Determine actual size required by measuring frames to receive glass at project site, or from guaranteed dimensions provided by Frame Supplier.

Cutting: All glass shall be cleancut. Nipping to remove flares or to reduce oversized dimensions of any type of glass will not be permitted.

Deliver glass to site in suitable containers that will protect glass from weather and from breakage. Store material in safe place to minimize breakage, but deliver sufficient glass to allow for normal breakage.

DESIGN AND PERFORMANCE REQUIREMENTS:

Watertight and airtight installation of each piece of glass is required. Each installation must withstand normal temperature changes, wind loading, impact loading (for operating doors) without failure of any kind including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glazing materials, and other defects in work.

PART 2: PRODUCTS

GLASS:

Tinted Solar Control Low-E Insulating Glass: Unless otherwise noted, 1" thick panels; 1/4" thick "deep cool-grey" low-reflective body-tinted float glass to exterior, 1/4" clear Low-E solar control glass to interior; Low-E shall be on the 3rd surface, with 1/2" space between glass panes by dessicant filled spacer and sealant device.

Exterior Glazing: Pilkington SuperGrey / Energy Advantage

Properties: Pilkington SuperGrey / Energy Advantage Low-E Glass

Glazing:	Exterior
Type:	Insulated
Total Thickness:	1" (24 mm)
Space Filler:	Dehydrated Air Space
Outboard Lite:	1/4" SuperGrey Tinted Float Glass
Inboard Lite:	1/4" Energy Advantage Low-E Glass, #3 Surface
Low-E Surface:	3 rd Surface

Heat Strengthened:	Safety as required – see elevations
Tempered:	Safety as required – see elevations

Visible Light Transmittance (%):	LT 7%
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Visible Lite Exterior Reflectance (%):	LRO 4%
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Visible Lite Interior Reflectance (%):	LRi 13%
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Total Solar Energy Direct Transmittance (%):	ET 5%
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Total Solar Energy Reflectance (%):	ER 4%
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U-V Transmittance (%):	UV 1%
Solar Heat Gain:	SHGC 0.15
Shading Coefficient:	TSC 0.18

Spandrel Glass: Spandrel glass at locations indicated shall be obscure ceramic coating on #4 surface.

Exterior Aluminum Entrance Doors: 1/4" Pilkington SuperGrey Low-E tempered safety glass, impact resistant as required.

Fire Rated Glass, Aluminum Doors and Frames: Where indicated, provide fire-rated impact resistant glass, doors and frames for protected openings as indicated on Drawings, equivalent to "Pyrostop" glass and "FIREFRAMES", "Heat Barrier Series", manufactured by Technical Glass Products. Conform to UL 10 C, UBC 7-2, and UBC 7-4, UL File No. R-19207, design U533. Frame tests to pass ASTM E-119, NFPA 251, UL 263, UL 9, UL 10C, UBC 7-2 and UBC 7-4.

Provide safety glass throughout as required by the IBC Code, and ANSI Z97.1 - American National Standard for Glazing Materials Used in Buildings -- Safety Performance Specifications and Method of Test.

Interior Doors Throughout: 1/4" clear tempered safety glass, impact resistant as required.

Interior Windows Throughout: 1/4" clear tempered safety glass, impact resistant as required.

SETTING BLOCKS AND SPACER SHIMS:

Fabricate blocks and shims from neoprene. Shape to required size and thickness. Material used for blocks and spacers must be compatible with type of compounds and sealants used and shall not cause staining or discoloration of sealant or frame.

Shore A durometer hardness of setting block and shim material shall be 70 to 90 points for setting blocks and 50 points for spacer shims, or as recommended by compound or sealant manufacturer.

METAL WINDOW PANELS

Metal window panels consist of metal skins laminated to stabilizer substrates with an insulating core material. Panels are designed to be glazed into a window system or curtain wall system.

Laminated metal faced insulated panels, Mapes-R as manufactured by Mapes Industries, Inc., 1" total thickness, with formed edges for glazing into a 1" glazing pocket.

Exterior & Interior Finish:: Kynar factory paint finish on standard 0.032" embossed aluminum, color as selected by Architect from standard colors. Provide 20-year finish warranty.

Substrate: .125" Hardboard

Insulation Core: 2.0 lb. density polystyrene
R-Value: R-4.74

GLAZING MATERIALS:

Sealant and Compound shall be Vulkem 116 by Master Mechanics Company, Maccolastic Acrylic Compound by Macco Division, Glidden Company, Betaseal 850 by Essex Chemical Company or approved equal.

Glazing Tape shall be butyl rubber sealant type partly vulcanized, self-adhesive, non-staining, elastomeric butyl rubber tape, complying with AAMA 800.

Bestaseal 650 Tape by Essex Chemical Company
Duraribbon 1070 by PPG Industries
176 Strucsureglaze by Protective Treatments Company

Compatibility: Where combination of sealing materials is required for glazing in same frame, manufacturer shall certify that all glazing materials furnished are compatible with each other and compatible with material used for setting blocks and spacer shims.

PART 3: EXECUTION

CONDITION OF SURFACES:

Preparation: Check all frames prior to glazing. Openings shall be square, plumb, and with uniform face and edge clearances. Maintain 1/8" minimum bed clearance between glass and frame on both sides.

Clean all surfaces to be glazed with xylol, a 50-50 mixture of acetone and xylol, or other solvents recommended by compound or sealant Manufacturer. Any defects affecting satisfactory installation of glass shall be corrected before starting of glazing.

Temperature: Do not apply any compound or sealant at temperatures lower than 40 degrees F.

INSTALLATION:

Workmanship: Apply glazing compound uniformly with accurately formed corners and bevels. Remove excess compound from glass and frame. Use only recommended thinners, cleaners and solvents. Do not cut or dilute glazing compound without approval from Architect. Make good contact with glass and frame when glazing and facing off.

Cleaning: Compound shall be removed from glass before it hardens. Remove any excess sealants from glass and adjoining surfaces during working time of material, within two to three hours.

Blocks and Spacers: Where setting blocks and spacer shims are required to be set into glazing compound or sealant, they may be butted with compound or sealant, placed in position, and allowed to set firmly prior to installation of glass.

Miscellaneous Interior Glazing: Unless otherwise indicated, all interior glass shall be channel glazed with glazing compound. Apply as follows:

Apply ample back compound to rabbet so that it will ooze out when glass is pressed into position and completely cover glass in rabbet. Press glass into position.

Secure glass in place by application of stop beads. Bed stop beads against glass and bottom of rabbet with compound, leaving proper thickness between glass and stop beads. Secure stop beads in place with suitable fastenings. Strip surplus compound from both sides of glass and tool at slight angle to provide clean sight lines.

Glazing Aluminum Entrances and Window Wall System:

Glass shall be set in accordance with aluminum entrances and window walls Manufacturer's shop drawings and instructions.

Install moldings level, plumb and square. Moldings at corners shall be accurately cut, neatly fitted, and joined as recommended by Storefront manufacturer.

REPLACEMENTS AND CLEANING:

Condition: At completion of work, all glass shall be free from cracks, sealant smears and other defects.

Protection/Replacement: Protect glass surfaces and edges during the construction period. Keep glass free from contamination by materials capable of staining glass. Any glass that is defective before acceptance, or within one year warranty period, as result of manufacturing, transporting, or performance of Contractor, shall be removed and replaced with new glass without cost to Owner.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

1.1 SECTION INCLUDES

- A. Formed metal stud framing at exterior and interior wall locations.
- B. Framing accessories

1.2 REFERENCES

- A. ASTM A123 — Zinc (Hot—Dip Galvanized) Coatings on Iron and Steel Products.
- B. ASTM A525 — General Requirements for Steel Sheet, Zinc—Coated (Galvanized) by the Hot—Dip Process.
- C. ASTM A591 — Steel Sheet, Cold—Rolled, Electrolytic Zinc—Coated.
- D. ASTM C645 — Non-Load (Axial) Bearing Steel Studs, Runners (Track) and Rigid Furring Channels for Screw Application of Gypsum Board.
- E. ASTM C754 — Installation of Steel Framing Members to Receive Screw—Attached Gypsum Wallboard, Backing Board, or Water—Resistant Backing Board.
- F. GA 203 — Installation of Screw—Type Steel Framing Members to Receive Gypsum Board.
- G. Metal Framing Manufacturers Association (MFMA) — Guidelines for the Use of Metal Framing.
- H. SSPC (Steel Structures Painting Council) — Steel Structures Painting Manual.

1.3 SYSTEM DESCRIPTION

- A. Metal stud framing system for exterior walls shall be 6" or 8" x 54 mil minimum structural studs, as noted on Drawings, as manufactured by Marino\Ware, Dietrich, Unimast, Clark Metal Framing Systems or approved equal. Refer to Drawings for metal stud sizes and thickness.
- B. Refer to drawings for interior metal stud sizes and gages.
- C. Design and size connection components to withstand dead and live loads caused by pressure and suction of wind acting normal to plane of wall as calculated in accordance with the North Carolina State Building Code for 90 mph wind loading.
- D. Maximum Allowable Deflection: 1/600 span.
- E. System to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
- F. Wall studs shall align in straight and true lines.

1.4 SUBMITTALS

- A. Shop Drawings: Indicate prefabricated work, component details, stud layout, framed openings, anchorage to structure, type and location of fasteners, and accessories or items required of other related work.
- B. Describe method for securing studs to tracks, splicing, and for blocking and reinforcement to framing connections.
- C. Product Data: Provide data describing standard framing member materials and finish, product criteria, load charts, limitations.
- D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with MFMA and ASTM C754.

1.6 QUALIFICATIONS

- A. Installer: Company specializing in performing the work of this section with minimum five years documented experience.

1.7 COORDINATION

- A. Coordinate with all trades the placement of components within the stud framing system to provide a totally sound and complete system installation ready to receive sheathing and wallboard.

PART 2: PRODUCTS

2.1 STUD FRAMING MATERIALS

- A. Studs: ASTM A525, ASTM A591, cold rolled steel, channel shaped, punched for utility access
 - 1. Depth: 8", 6", 3 5/8" as shown on the drawings.
 - 2. Thickness: 54 mil minimum at 8" and 6" studs and 33 mil minimum 3 5/8" studs.
 - 3. Width minimum 1 5/8" with 1/2" stiffening return both flanges.
- B. Runners: Of same material and thickness as studs unless otherwise noted.
- C. Furring and Bracing Members: Of same material as studs; thickness to suit purpose.
- D. Fasteners: Stainless steel or zinc coated #12 pan head, self-drilling, self tapping screws.
- E. Anchorage Devices: Powder actuated fasteners and screws as shown on drawings.
- F. Touch—Up Primer for Galvanized Surfaces: SSPC — Paint 20 Type I Inorganic.

2.3 FABRICATION

- A. Fabricate assemblies of framed sections to sizes and profiles required; with framing members fitted, reinforced, and braced to suit design requirements.

- B. Fit and assemble in largest practical sections for delivery to site, ready for installation.
- C. Studs shall bear tightly against the top and bottom track.

2.4 FINISHES

- A. Studs: Galvanize to G60 coating class.
- B. Tracks and Headers: Galvanize to G60 coating class.
- C. Accessories: Same finish as framing members.

PART 3: EXECUTION

3.1 EXAMINATION

- A. Verify that conditions are ready to receive work.
- B. Verify that rough—in utilities are in proper location.

3.2 ERECTION

- A. Align and secure top and bottom runners.
- B. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.
- C. Install studs vertically uniformly at the spacings shown on the drawings.
- D. Align stud web openings horizontally.
- E. Secure studs to tracks using screws or welding.
- F. Stud splicing not permissible.
- G. Fabricate corners using a minimum of three studs.
- H. Minimum double stud at wall openings, door and window jambs, not more than 2 inches from each side of openings. Refer to drawings for additional jamb and head conditions.
- I. Brace stud framing system rigid.
- J. Coordinate erection of studs with requirements of doorframes, window frames, and; install supports and attachments.
- K. Coordinate installation of wood bucks, anchors, and wood blocking with electrical and mechanical work to be placed within or behind stud framing.
- L. Blocking: Secure wood blocking to studs. Secure steel channels to studs. Install blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, hardware, etc. as required by Architect.
- M. Coordinate placement of insulation in stud spaces made inaccessible after stud framing erection.
- N. Fabricate and install headers at openings as indicated on drawings.

- O. All multiple members shall be stitch welded together with 1" seam welds spaced at 16" oc maximum both sides of members to form a totally composite member. Multiple members in composite units shall not be spliced.
- P. All connections not shown on the drawings shall be designed by the supplier to support the imposed loads.
- Q. Provide continuous 2" x 43 mil horizontal strap bridging at 48" maximum intervals on both flanges. Install with 1 screw per stud. Provide solid blocking using a piece of metal stud between studs at each end of bridging run and at 12' oc maximum. Terminate bridging at wall openings with solid blocking bridging as required.
- R. Place one stud tightly against each side of the tubular steel columns in line with the wall. Align the face of stud flush with face of tubular columns for smooth finish application for dry wall and sheathing. Fasten stud to column with powder actuated fasteners spaced at 16" oc.

3.3 ERECTION TOLERANCES

- A. Maximum Variation From True Position: 1/4 inch.
- B. Maximum Variation of any Member from Plane: 1/4 inch.
- C. Maximum Variation From Plumb: 1/4 inch in 10' height.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

DESCRIPTION OF WORK:

Under this Section, provide gypsum board for walls, partitions, ceilings, ceiling access doors and fireproofing for beams and columns as indicated on drawings and as specified herein.

Note all gypsum drywall, except as noted on drawings and with exception of walls scheduled for vinyl wall covering, shall be provided with a fine textured spray applied finish, applied prior to coats of paint, matching USG "Orange Peel" texture.

INDUSTRY STANDARDS:

For listing of names of industry standard agencies mentioned by abbreviation in this Section refer to Section 01068.

QUALITY ASSURANCE:

Manufacturers:

Standard: For purposes of designating type and quality for work under this Section, Drawings and Specifications are based on products manufactured or furnished by United States Gypsum Company.

Acceptable Manufacturers: Products of following manufacturers which meet all requirements of these specifications will be acceptable:

- U.S. Gypsum
- Celotex Corporation
- G-P / Bestwall Div. of Georgia-Pacific
- Johns-Manville
- National Gypsum Company

Source: Products for use on this Project shall be of one Manufacturer for same function, unless noted specifically otherwise herein.

SUBMITTALS:

Manufacturer's Data: Submit (in duplicate) Manufacturer's printed catalog cuts, installation instructions, and finishing instructions.

Test Reports: Submit (in duplicate) reports from Underwriter's Laboratories, Inc. or other acceptable testing agencies, on fire tests of designs referred to in Contract Documents.

Mock-up Sample: Fabricate a field sample mock-up of gypsum wallboard with the specified "orange peel" texture applied, for review and approval by Architect. Approved mock-up will stand on site for reference as the project standard for all orange peel textured walls.

Mock-up Sample: Fabricate a field sample mock-up of gypsum wallboard aluminum reveals, for review and approval by Architect. Approved mock-up will stand on site for reference as the project standard for all aluminum reveal walls.

PRODUCT HANDLING:

Delivery: Deliver materials in original packages, containers or bundles bearing brand name and name of manufacturer or supplier for whom product is manufactured.

Storage: Gypsum board and insulation material delivered prior to use shall be stored within completely weather tight structure, off ground, and completely enclosed within weather tight covering. Stack all board materials on 2"x 4" risers, spaced 16" o.c. Weather tight covering shall also extend completely under stacked material to prevent seepage of moisture if over uncovered ground or damp slab.

Handling: Exercise care, during handling and storage, to avoid undue sagging or damage to edges, ends, and surfaces.

ENVIRONMENTAL CONDITIONS:

Building: Application of gypsum board shall commence only after structure is completely weather -tight.

Temperature: In cold weather and during period of gypsum board application and joint finishing maintain temperatures in building uniformly within range of 55 degrees to 70 degrees F. Provide adequate ventilation to eliminate excessive moisture in building during same period.

PART 2: PRODUCTS

MATERIALS:

Gypsum Board shall be furnished in 48" widths and in lengths of at least 2" greater than height from floor to finished ceiling to permit vertical installation of all boards. Contractor shall have option to furnish boards for vertical installation full height to structure above where required in one sheet, 48" wide.

Types: Gypsum Board shall conform to following:

1. Gypsum Board shall be fire-resistive type throughout of various thicknesses indicated, equivalent to Sheetrock Brand Firecode C. Provide impact resistant gypsum wallboard at locations indicated on Drawings.
2. All 5/8" thick gypsum board shall be taper-edged, fire-resistive, conforming to ASTM C 36.
3. Water-Resistant Gypsum Board shall be "Sheetrock W/R/Gypsum Wallboard" 5/8" tapered-edge with treated manila paper finish and "Sheetrock W/R Fire-code C Wallboard, 5/8" tapered-edge with treated manila paper finish for 1 hour rated partitions. Use 5/8" water-resistant gypsum board for ceilings of janitor closets, shower rooms, tub rooms.
4. Tile Backer Board: Use 5/8" tile backer board for backup of all areas scheduled to receive thin set ceramic tile. Moisture resistance silicone core reinforced with inorganic glass fiber matt. "DenShield Tile Guard" by Georgia-Pacific, or equal approved by Architect.
5. Exterior Wall Sheathing Board shall be 5/8" thick fire retarding fiberglass reinforced gypsum board: "Dens-Glass Gold" by Georgia-Pacific, or equal approved by Architect.

6. Gypsum Soffit board shall be 5/8" thick, fire coded, exterior gypsum soffit board by Bestwall, U. S. Gypsum, or approved equal.
7. Wall Spray Texture: SHEETROCK Wall & Ceiling Spray Texture, SHEETROCK Wall & Ceiling Texture (TUF-TEX), SHEETROCK Wall & Ceiling Spray Texture – Ready Mixed.

FASTENERS:

Screws for attachment of board to metal studs and metal ceiling and wall furring shall be 7/8" or 1" US Drywall Screw, Type S. All screws shall have bugle head.

METAL AND PLASTIC CORNER BEADS AND TRIM:

Interior Work:

Plastic: All external corners are to be bullnozed radius trimmed unless otherwise indicated.

Metal: Fabricate metal corner beads from galvanized steel, not lighter than 0.02" nominal thickness, in following shapes and sizes.

1. Corner Beads for all 90 degree external corners shall be USG No. 100-Perf-A-Bead.
2. Corner Beads for all radiused external corners shall be heavy duty plastic, No. BCB100, radiused bullnoze corner bead by Vinyl Corporation or equal.
3. Metal Trim shall be USG 200 Series Perf-A-Trim, sized for wallboard thickness.
4. Anodized Aluminum Reveals: Continuous anodized aluminum reveals shall be provided in profile and layout indicated on Drawings, with factory fabricated intersections. Install or provide mock-up installation samples for Architect's review and obtaining final approval prior to proceeding with installations. Fry Reglet or equivalent.

REINFORCING TAPE AND JOINT TREATMENT (INTERIOR)

Tape shall be "Perf-A-Tape", or approved equal.

Compound for embedding and fill coat application shall be "Perf-A-Tape Joint Compound".

Compound for finishing shall be "Perf-A-Tape Topping Compound".

ADHESIVE AND CAULKING:

Laminating Adhesive: Laminating adhesive for face layer application in double-layer systems shall be "Perf-A-Tape Joint Compound, embedding type".

Caulking Compound: Acoustical type sealant, furnished by Gypsum Board products manufacturer.

CRACK CONTROL JOINTS:

Crack control joints shall be provided in pre-approved locations as directed by the Drawings and the Architect, at each jamb of windows exceeding 10' in width, walls at 40' intervals, and ceilings at 30' intervals. Provide manufacturer standard metal exp/control joint material.

PART 3: EXECUTION

CONDITION OF SURFACES:

Inspection: Examine surfaces to receive gypsum board for defects, which might impair quality of finished installation. Do not start work until such defects have been corrected.

Framing Spacing: Framing members to which gypsum board will be fastened shall be straight and true, and spaced as indicated on Drawings, not to exceed 16" o.c. for walls and ceilings. Framing and bridging members shall be adequate to carry design or code loading. Bridging members shall be spaced 48" o.c.

Supplemental Framing: Provide back blocking and framing as necessary for support of fixtures and all mounted equipment.

Coordination: Conduit, piping, retainers for corner guards and other items to be concealed by or penetrating, wallboard shall be installed and tested before applying wallboard.

INSTALLATION OF GYPSUM BOARD:

Cutting and Fitting:

Cut gypsum board by scoring and breaking, or by sawing. Work from face side.

Cut edges and ends of gypsum board shall be smoothed where necessary, in order to obtain neat jointing when board is erected.

Cut-outs for pipes, fixtures or other small openings shall be scored on face and back in outline before removal, or shall be cut out with saw or other suitable tools.

Where gypsum board meets projecting surfaces, scribe and cut neatly, fitting closely for caulked joint.

Application of Gypsum Board:

Apply continuous bead of Acoustical Sealant on floor at line of contact of board.

Walls: Apply gypsum board vertically, pressing into sealant, with boards in moderate contact, but not forced into place. At interval and external corners conceal cut edges of boards by overlapping covered edges of abutting boards. Arrange joints on opposite sides of partitions so as to occur on different framing members. Place long dimensions of panels parallel to furring or framing members. Panels shall be of length required to reach from 2" above ceiling line to floor line in one continuous length. Make joints over framing or furring members.

Ceilings: Apply board to ceilings with long dimension of board at right angles to furring members. At perimeters of all ceilings, edge joint shall be laid on metal trim strip against continuous bead of caulking, applied in advance of board application.

Gypsum Board End Joint at masonry walls shall be laid on metal trim strip against continuous bead of caulking, applied in advance of board application.

Corner Beads and Metal Trim: Internal corners do not require corner beads, but shall be reinforced with tape. External corners shall have corner bead fitted neatly over corner, and secured with same type fasteners used for applying wallboard.

ATTACHMENT:

Method: Space fasteners not less than 3/8" nor more than 1/2" from edge and ends of board. While fasteners are being driven, hold board in firm contact with under laying support. Application of fasteners

shall proceed from central portion of board to ends and edges. If paper surface is broken by fastener in attachment, drive another fastener approximately 2" from faulty fastener.

Drive screws to provide screw head penetration just below gypsum board surface.

Spread adhesive over laminating surface of face or base layer gypsum board. Extend adhesive up to ends and edges of all board.

Spacing of Fasteners shall be as follows:

Screw Method: Space screws at maximum of 12" o.c. for ceilings and 16" o.c. for walls.

Corner Beads and Trim shall have fasteners spaced 6" o.c. driven through gypsum board into framing members.

JOINT FINISHING AND FASTENER CONCEALMENT:

Provide "LEVEL 4" gypsum wallboard finish at all areas, unless indicated otherwise.

Method: Mix and use joint compound and topping compound in accordance with manufacturer's recommendations printed on bag. Apply by machine or hand tool. Allow minimum drying time of 24 hours between adhesive coats. Sand all coats as necessary after each application. Clean excess compound from surface of gypsum board as compound is applied.

Reinforcement: Reinforce wall and ceiling angles and inside vertical corner angles with tape folded to conform to adjoining surfaces, and to form straight, true angle. All gypsum board joints except joints at metal trim shall be tapered.

Embedment Coat: Apply thin, uniform layer of joint compound (embedding type) approximately 3" wide over joint to be reinforced. Center tape over joint and seat into compound; leaving sufficient compound under tape to provide proper bond. Apply skim coat of compound immediately after embedding tape.

Fill Coat: After drying, cover embedding compound with fill coat of compound. Spread evenly over and slightly beyond tapered edge area of board. Feather at edges.

Topping: Cover fill coat with topping compound. Spread evenly over and slightly beyond edge of proceeding coat. Feather with smooth, uniform finish.

Fastener Concealment: Treat dimples at fasteners (and holes where temporary fasteners are removed) with three coats of joint compound applied as each coat is applied to joints.

Conceal flanges of all corner beads and trim members by minimum of two coats of compound applied strictly in accordance with Manufacturer's directions.

Caulking:

Joints at Penetrations: Where pipes, conduits, ducts, electrical devices, etc., penetrate gypsum board, seal joint around perimeter with caulking compound.

Joints between ceilings and walls shall be sealed continuously with acoustical sealant, as specified above.

CEILING ACCESS DOORS: Provide 24" x 24" x 16 gauge minimum primed steel ceiling access doors each space with drywall ceiling, hinged and with key lock. Provide UL Listed fire rated doors all locations where rating is required. Recessed faces of access doors shall be filled with gypsum board to match adjacent ceilings. Secure 1/2" resilient furring channels 16" o.c. to face of door with sheet metal screws.

Screw 1/2" thick gypsum board to channels as specified hereinbefore. Provide USG No. 200-B metal trim on all edges of gypsum board. Finish as specified hereinbefore.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

DESCRIPTION OF WORK:

Work under this section includes providing metal stud partition system, metal ceiling furring system, metal wall furring system and metal ceiling suspension system, for installation of gypsum board.

INDUSTRY STANDARDS:

For listing of names of industry standard agencies mentioned by abbreviation in this section refer to Section 01068.

QUALITY ASSURANCE:

Manufacturers:

Standard: For purposes of designating type and quality for work under this Section, Drawings and Specifications are based on products manufactured or furnished by United States Gypsum Company.

Acceptable Manufacturers: Products of following manufacturers, which meet all requirements of these specifications, will also be acceptable:

- Celotex Corp.
- Flintkote Co.
- GP/Bestwall Div. of Georgia-Pacific Co.
- Johns-Manville
- National Gypsum Co.

Source: Products for use on this Project shall be of one manufacturer for same function, unless noted specifically otherwise herein.

SUBMITTALS:

Shop Drawings: Show complete details of construction, including gauges of metal, anchors, fastenings, special fittings, and accessories. Show ceiling framing and furring, special wall framing, and framed openings.

Manufacturer's Data: Submit (in duplicate) Manufacturer's printed data on materials and installation for work specified herein. Include reports on fire tests and physical data.

PRODUCT HANDLING:

Delivery: Deliver materials to Project site in the original packages, containers or bundles, bearing brand name, and name of manufacturer or supplier for whom product is manufactured.

Storage: Store materials to prevent damage from exposure to elements.

PART 2: PRODUCTS

METAL STUD PARTITION SYSTEM: Metal stud partition system shall be USG Metal Stud System, or approved equal, designed for screw attachment of gypsum board, furnished with required fasteners and accessories for complete system.

Steel Studs shall be C-shaped, formed from not less than 20-gauge galvanized steel sheets, USG width as shown on drawings. Stud webs shall have punched holes throughout for utility lines or wiring.

Metal Floor and Ceiling Runners shall be channel-shaped, formed from not less than 25-gauge galvanized steel sheets, with minimum 1-1/4" flanges and web-sized to nest with steel studs specified.

Screws for attachment of studs to runner and other framing fastening where specified shall be 3/8" USG Drywall Screw, Type S, pinhead.

WALL FURRING SYSTEM: Wall furring system shall be USG Drywall Wall Furring System, designed for screw attachment of gypsum board furnished with required fasteners and accessories for complete system.

Furring Channels shall be hat-shaped USG Drywall Furring Channels, or equal, roll-formed from not less than 25-gauge galvanized steel, 2-3/4" wide by 7/8" deep with 1/2" minimum wing flanges and 1-3/8" minimum crown width for gypsum board attachment.

Fasteners for attachment of furring channels (or wall furring brackets) shall be as recommended by furring manufacturer.

Brackets for furred-out utility space shall be USG adjustable wall furring brackets, formed from not less than 20-gauge galvanized steel. Horizontal leg shall have serrated edges for wire-tie of carrying channels.

Carrying Channels shall not be less than 16-gauge cold-rolled channels, 3/4" web width and 1/2" flange depth, spaced 48" on center maximum. Finish with black asphaltum.

Tie Wire shall be not less than 16-gauge soft annealed carbon steel wire.

CEILING FRAMING SYSTEM: Ceiling-framing system for furred and suspended gypsum board ceilings shall be USG Drywall Ceiling System, designed for screw attachment of gypsum board, furnished with required fasteners and accessories for complete system.

Furring Channels for gypsum board applied to ceiling framing shall be hat-shaped USG Drywall Furring Channels, roll-formed from not less than 25-gauge galvanized steel, 2-3/4" wide by 7/8" deep with 1/2" minimum wing flanges and 1-3/8" minimum crown width for gypsum board attachment. Provide cross-carrying channels as specified at 48" centers.

Furring Channels for dropped ceilings, soffits, and where indicated at expansion joints shall be C-shaped studs, formed from not less than 25-gauge galvanized steel sheets, and of sizes indicated on Drawings.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Scope of work includes providing a 3/8" thick epoxy terrazzo finish, a minimum of 800 grit polish. Colors and pattern to match existing.
- B. Section Includes:
 - 1. Thin-set Epoxy Terrazzo Flooring including preparation of substrates.
 - 2. Related accessories.
- C. Related Sections:
 - 1. Division 3, Concrete, (for depressed floor slab requirements).
 - 2. Division 4, Masonry.
 - 3. Division 5, Metals.
 - 4. Division 7, Thermal and Moisture Protection
 - 5. Division 9, Finishes
 - 6. Division 15A, Furnishing and setting floor drains.
 - 7. Section 01040, Temporary heat, water and electricity.

1.03 SUBMITTALS

- A. Manufacturer's product data for each type of terrazzo and accessory.
 - 1. Physical properties.
 - 2. Performance properties.
 - 3. Specified tests.
 - 4. Material Safety Data Sheet.
 - 5. Manufacturer's standard warranty.
- B. Shop Drawings: Include terrazzo installation requirements. Include plans, elevations, sections, component details and attachments to other work. Show layout of the following:
 - 1. Divider strips.
 - 2. Control- and expansion-joint strips.
 - 3. Base and border strips.
 - 4. Abrasive strips.
 - 5. Terrazzo patterns.
- C. Samples for Initial Selection: NTMA and Manufacturer's color plates showing the full range of colors and patterns available for each terrazzo type indicated, using premium marble terrazzo chips from the Carolina Colors Collection.
- D. Samples for Verification: Match Architect's samples for each type, material, color and pattern of terrazzo and accessory required showing the full range of color, texture and pattern variations expected. Label each terrazzo sample to identify manufacturer's matrix color and aggregate types, sizes and proportions. Prepare samples of same thickness and from same material to be used for the Work in size indicated below:
 - a. Epoxy Terrazzo: minimum 6" x 6" (152.4 mm x 152.4 mm) sample of each color and type of terrazzo.
 - b. Accessories: 6" length (152.4 mm) of each kind of divider strip, stop strip and control joint strip required.
- E. Manufacturer Experience:
 - a. Submit proof of Associate membership in NTMA.
 - b. Furnish a list of at least five (5) epoxy terrazzo projects using material being submitted for this project installed during the last five (5) years of the same scope, complexity and at least 50 percent of the square footage.
 - c. Epoxy manufacturer shall have 10 years of experience in sales and manufacturing epoxy for installation with NTMA members.
- F. Qualification Data: For qualified Installer.
 - a. Submit proof of Contractor membership in NTMA.

- b. Furnish a list of at least five (5) epoxy terrazzo projects using material being submitted for this project installed during the last five (5) years of the same scope, complexity and at least 50 percent of the square footage.
- G. Material Test Reports: For moisture and/or relative humidity of substrate.
- H. Maintenance Data: Submit 5 copies of NTMA maintenance recommendations and 5 copies of manufacturer's instructions

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who is acceptable to Architect and epoxy terrazzo manufacturer to install manufacturer's products.
 - 1. Engage a terrazzo contractor with at least five (5) years of satisfactory experience in installation of epoxy terrazzo. Terrazzo contractor shall demonstrate experience during last five (5) years of at least (5) projects of comparable scope and complexity of at least 50 percent of the total square footage of this project
 - 2. Engage an installer who is a contractor member of NTMA.
- B. Source Limitations:
 - 1. Obtain primary Epoxy Terrazzo Flooring System materials including membranes, primers, resins and hardening agents from a single manufacturer with proof of NTMA membership.
 - 2. Obtain aggregates, divider strips, sealers, cleaners from source recommended by primary materials manufacturer.
- C. Pre-installation Conference: Conduct conference at Project site to review methods and procedures related to terrazzo including, but not limited to, the following:
 - 1. Inspect and discuss installation procedures, joint details, jobsite conditions, depressed substrate specification, vapor barrier details and coordination with other trades.
 - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment and facilities needed to make progress and avoid delays.
 - 3. Review special terrazzo designs and patterns.
 - 4. Review dust control procedures.
 - 5. Review plans for concrete curing and site drying to enable timely achievement of suitable slab moisture conditions.
- D. NTMA Standards: Comply with NTMA's "Terrazzo Specifications and Design Guide" and with written recommendations for terrazzo type indicated unless more stringent requirements are specified.
- E. LEEDS NC: Submit certification from Manufacturers of all terrazzo flooring materials and accessories that products are sustainable products, listing all applicable LEED U.S. Green Building code council's credits made available by certification.
- F. SCAQMD: Floor coatings shall not exceed the VOC content limits established in South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings.
- G. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups for terrazzo including accessories.
 - a. Size: Minimum 100 sq. ft. of typical poured-in-place flooring condition for each color and pattern in locations directed by Architect.
 - 2. Approved mockups may become part of the completed Work if undistributed at time of Substantial Completion.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to Project site in supplier's original wrappings and containers, labeled with source's or manufacturer's name, material or product brand name and lot number if any.
- B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures and humidity.
 - 1. Storage temperatures should be between 60°F to 80°F.

1.06 PROJECT CONDITIONS

- A. Terrazzo contractor shall, prior to surface preparation:
 - 1. Evaluate depressed slab condition, including slab moisture content and extent of repairs required, if any.

2. Maintain the ambient room and floor temperature at 60°F or above for a period extending 72 hours before, during and after floor installation. Concrete to receive epoxy terrazzo shall have cured for at least 28 days and be free of all curing compounds. Test concrete substrate to determine acceptable moisture levels prior to installation. Testing should be conducted according to ASTM F2170 (determining relative humidity in concrete slabs using in situ probes).
- B. Prior to and during each day of installation, the terrazzo contractor shall verify that the dew point is at least 5°F less than the slab and air temperature.
- C. Acceptable Substrates:
 1. Depressed concrete sub-floor at all terrazzo locations, confirm and verify depth.
 2. Level tolerance: Concrete sub-floor shall be level with a maximum variation from level of 1/4" in 10 feet. Any irregularity of the surface requiring patching and/or leveling shall be done using the manufacturer's fill of selected aggregates as recommended by manufacturer.
 3. Concrete floor shall be prepared mechanically by shot blasting in accordance with ICRI Guideline No. 03732. Specifically, surface preparation results should achieve a CSP3-CSP5 profile.
 4. Concrete floor shall receive a steel trowel finish.
 5. Concrete shall be cured a minimum of 28 days. No curing agents are to be used in areas to receive terrazzo.
 6. Concrete slab shall have an efficient moisture vapor barrier directly under the concrete slab. Moisture vapor barrier shall be an approved puncture resistant polyethylene sheet not less than 15 mils thick, in compliance with 03200 requirements. Moisture barrier shall NOT be punctured.
 7. Saw cutting of control joints must be done between 12 and 24 hours after placement of the structural concrete and at a frequency compatible to ACI recommendations.
- D. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during terrazzo installation.
- E. Provide protection from other trades prior to final acceptance by Owner.

PART 2 – PRODUCTS

2.01 EPOXY TERRAZZO

- A. Products Systems Overview: The basis of design and specifications are products manufactured by Terroxy® Resin Systems Epoxy Matrix by Terrazzo & Marble Supply Companies, Wheeling, IL (www.tmsupply.com) Equal system by General Polymers from Sherwin Williams or Master Terrazzo Technologies or others will be accepted provided each is pre-approved by Architect in accordance with the General Conditions.
- B. Materials:
 1. Primer: Terroxy® Primer or Terroxy® Moisture Vapor Primer (for slabs on-grade or light-weight and green concrete).
 - a. Physical properties of moisture mitigating primer shall have a maximum of 0.3 perms with 100% RH.
 2. Flexible Reinforcing Membrane: Terroxy® Iso-Crack Epoxy Membrane, for substrate crack preparation and reflective crack reduction.
 - a. Provide for a minimum of 10% for the project
 - b. Reinforcement: Fiberglass scrim.
 3. Epoxy Matrix: Terroxy® Epoxy Matrix and in color required for mix indicated.
 - a. Physical properties without aggregates. All specimens cured for 7 days at 75°F plus or minus 2°F and 50 percent plus or minus 2 percent RH. This product shall meet the following requirements:

Property	Test Method	NTMA Requirements	Thin-set Epoxy Terrazzo Typical Results
Hardness	ASTM D-2240 using Shore-D Durometer	60-85	75-85

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**FINISHES
TERRAZZO**

Tensile Strength	ASTM D-638	3,000 psi min.	4,800 psi min.
Compressive Strength	ASTM D-695 Specimen B cylinder	10,000 psi min.	12,000 psi min.
Flexural Strength	ASTM D-790	Not specified	4,500 psi min.
Chemical Resistance	ASTM D-1308 seven days at room temperature by immersion method	No deleterious effects: <ul style="list-style-type: none"> ▪ Distilled Water ▪ Mineral Oil ▪ Isopropanol ▪ Ethanol ▪ 0.025 Detergent Solution ▪ 1% Soap Solution ▪ 10% Sodium Hydroxide ▪ 10% Hydrochloric Acid ▪ 30% Sulfuric Acid ▪ 5% Acetic Acid 	No deleterious effects: <ul style="list-style-type: none"> ▪ Distilled Water ▪ Mineral Oil ▪ Isopropanol ▪ Ethanol ▪ 0.025 Detergent Solution ▪ 1% Soap Solution ▪ 10% Sodium Hydroxide ▪ 10% Hydrochloric Acid ▪ 30% Sulfuric Acid ▪ 5% Acetic Acid

- b. Physical properties with aggregates. For Epoxy Matrix blended with three volumes of Georgia White marble blended 60% #1 chip and 40% #0 chip, ground and grouted with epoxy resin according to Installation Specifications, finishing to a nominal 3/8" thickness. All specimens cured for 7 days at 75°F plus or minus 2°F and 50 percent plus or minus 2 percent RH. This finished Epoxy Matrix shall meet the following requirements:

Property	Test Method	NTMA Requirements	Thin-set Epoxy Terrazzo Typical Results
Flammability	ASTM D-635	Self-extinguishing, extent of burning 0.25 inches max.	Self-extinguishing, extent of burning 0.25 inches max.
Thermal Coefficient of Linear Expansion	ASTM D-696	25x10 ⁻⁶ inches per inch per degrees to 140°F	25x10 ⁻⁶ inches per inch per degrees to 140°F
Bond Strength	ACI COMM 403, Bulletin 59-43 (pages 1139-1141)	300 psi (100% concrete failure)	300 psi (100% concrete failure)

4. Aggregate Chips Mix: Provide an aggregate chips mix from the Carolina Colors Collection, Premium Carolina Marble Terrazzo Chips.
5. Aggregates: Complying with NTMA gradation standards for mix indicated and containing no deleterious or foreign matter.
 - a. Obtain aggregates from a local regional source: Southern Aggregates, Staley, NC
 - b. Abrasion and Impact Resistance: Less than 40 percent loss per ASTM C 131.
 - c. 24-Hour Absorption Rate: Less than 0.74 percent.
 - d. Dust Content: Less than 1.0 percent by weight.
 - e. Postindustrial Recycled Content: No less than NTMA minimum standard
6. Finishing Grout: Terroxy® Epoxy Matrix or Terroxy® Clear Resin as recommended by Terroxy® Resin Systems.
- C. Mix: Comply with NTMA's "Terrazzo Specifications and Design Guide" and manufacturer's written instructions for matrix and aggregate proportions and mixing.
 - a. Color and Pattern Schedule: When designations are indicated or scheduled, provide specified terrazzo matrices matching the Architect's approved samples:

2.02 STRIP MATERIALS

- A. Thin-set Divider Strips: L-type.

1. Material: White-zinc alloy.
2. Guide for commonly used L-type divider strips for Thin-set Epoxy Terrazzo Systems:

System Height	Strip Height	Strip Width
3/8" System	3/8"	16 gauge
		1/8"
		1/4"

- B. Control-Joint Strips: Separate double L-type angles back to back with minimum 1/8" width between. Fill area between strips with 100% solids epoxy filler. Match material, thickness and color of divider strips and depth required for topping thickness indicated.
- C. Isolation (Expansion) Joint Strips: Separate double L-type angles, positioned back to back with minimum 1/8" width between. Fill area between strips with Terroxy® Joint Filler. Match material, thickness and color of divider strips and depth required for topping thickness indicated.
- D. Accessory Strips: Match divider strip width, material and color unless otherwise indicated. Use the following types of accessory strips as required to provide a complete installation:
 1. Edge-bead for exposed edges of terrazzo.

2.03 MISCELLANEOUS ACCESSORIES

- A. Strip Adhesive: 100% solids epoxy resin adhesive recommended by Terroxy® Resin Systems.
 1. Use adhesive that has a VOC content of 50g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Anchoring Devices:
 1. Strips: Provide epoxy adhesive/mechanical anchoring devices for strip materials as required for secure attachment to substrate.
- C. Patching and Fill Material: Terroxy® Fill and selected aggregates as recommended by Terroxy® Resin Systems.
- D. Joint Compound: Terroxy® Joint Filler, color to be selected by architect to match/compliment terrazzo.
- E. Cleaner: Terroxy® Terra Clean, a neutral cleaner with pH factor between 7 and 10 specifically designed for terrazzo.
- F. Surface Finish System: Level of polish shall be an 800 grit minimum finish to match Architect's approved sample, with respect to and in accordance with desired appearance and level of reflectivity.
- G. Sealer: Slip- and stain-resistant sealer that is chemically neutral with a pH factor between 7 and 10, a standard coefficient of friction of 0.6 or higher, does not affect physical properties of terrazzo and complies with NTMA's "Terrazzo Specifications and Design Guide". Architect to final select from submitted data after review of manufacturer's recommendation.
 1. Terroxy® Acrylic Sealer, high performance, high gloss acrylic sealer; VOC content free, compatible with an 800 grit finish.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine depressed slabs, substrates and areas, with Terrazzo Contractor present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions, including level tolerances, have been corrected.

3.02 PREPARATION

- A. Clean substrates of substances, including oil, grease and curing compounds, that might impair terrazzo bond. Provide clean, dry and neutral substrate for terrazzo application.
- B. Concrete Slabs:

1. Provide sound depressed concrete surface free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil and other contaminants incompatible with terrazzo.
 1. Prepare concrete mechanically by shot blasting. Surface preparation results should achieve a CSP3-CSP5 profile according to ICRI Guideline No. 03732.
 2. Repair or level damaged and deteriorated concrete according to Terroxy® Resin Systems Technical Bulletin 008 Substrate Leveling Requirements for Terroxy® Thin-Set Epoxy Terrazzo
 3. Repair cracks and non-expansion joints greater than 1/16" (1.6 mm) wide according to Terroxy® Resin Systems Technical Bulletin 009 Crack Detailing and Joint Treatments for Terroxy® Resin Thin-set Epoxy Terrazzo.
2. Verify that concrete substrates are visibly dry and free of moisture.
3. Moisture Testing:
 - a. Test for moisture according to ASTM F2170 (determining relative humidity in concrete slabs using in situ probes), with an in situ probe equivalent to the "RH BluePeg" distributed by Terrazzo & Marble Supply.
 - b. Proceed with installation only after substrates have a maximum relative humidity measurement reading less than 80%. If relative humidity measurement reading is greater than or equal to 80%, Terroxy® Moisture Vapor Primer is recommended. Provide unit price on General Contractor's Bid Form of Proposal. Apply to terrazzo substrates in accordance with manufacturer's written instructions.
- C. Protect other work from dust generated by grinding operations. Control dust to prevent air pollution and comply with environmental protection regulations.
 1. Erect and maintain temporary enclosures and other suitable methods to limit dust migration and to ensure adequate ambient temperatures and ventilation conditions during installation.

3.03 EPOXY TERRAZZO INSTALLATION

- A. General:
 1. Comply with NTMA's written recommendations for terrazzo and accessory installation.
 2. Place, rough grind, grout, cure grout, fine grind and finish terrazzo in accordance with manufacturer's written instructions and NTMA's "Terrazzo Specifications and Design Guide."
 3. Ensure that matrix components and fluids from grinding operations do not stain terrazzo by reacting with divider and control-joint strips.
 4. Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted.
- B. Thickness: 3/8"; depress concrete slab substrates accordingly.
- C. Flexible Reinforcing Membrane: (Provide for in bids a minimum of 10% of project square footage of crack isolation membrane)
 1. Membrane application for isolated cracking: Route out all cracks and fill with 100% solids epoxy filler. Apply Terroxy® Iso-Crack Epoxy Membrane (spread at 40 mils thickness) across the crack allowing 12 inches on either side. Imbed fiberglass scrim into wet membrane and saturate with additional membrane.
 2. Membrane application for extensive cracking or crack prevention: Route out all cracks and fill with 100% solids epoxy filler. Apply Terroxy® Iso-Crack Epoxy Membrane (spread at 40 mils thickness) over prepared substrate to produce full substrate coverage in areas to receive terrazzo.
- D. Primer: Apply to terrazzo substrates according to Terroxy® Resin Systems Primer Product Data Sheet.
- E. Strip Materials:
 1. Divider and Accessory Strips:
 - a. Install strips in adhesive setting bed without voids below strips or mechanically anchor strips as required to attach strips to substrate.
 - b. Control-Joint Strips: Separate double L-type angles back to back with minimum 1/8" width between. Fill joint with 100% solids epoxy filler. Fill area between strips with Terroxy® Joint Filler. Match material, thickness and color of divider strips and depth required for topping thickness indicated.

- c. Isolation (Expansion) Joint Strips: Separate double L-type angles, positioned back to back with minimum 1/8" width between. Fill area between strips with Terroxy® Joint Filler. Match material, thickness and color of divider strips and depth required for topping thickness indicated.
- F. Placing Terrazzo:
 1. Mix epoxy matrix with chips and fillers in ratios directed by Terroxy® Resin Systems matching a sample approved by Architect.
 2. Trowel apply terrazzo mixture over epoxy primer to provide a dense flat surface to top of divider strips. Allow to cure per Terroxy® Resin Systems recommendations before rough grinding.
 3. Rough Grinding:
 - a. Grind with 24 grit silicon carbide or D-36 Diamond matrix stones until all Terrazzo strips and marble chips are uniformly exposed.
 - b. Follow initial grind with 80 or finer grit stones.
- G. Grouting:
 1. Cleanse floor with clean water and rinse.
 2. Remove excess rinse water by wet vacuum, dry and fill voids with Terroxy® Resin Systems Epoxy Matrix or Clear Resin.
 3. Allow grout to cure. Grout may be left on terrazzo until other trades work is completed.
- H. Polishing:
 1. Grind with 50 or 60, 80 to 120 grit stones and then progressively finer stones until all grout is removed from surface. Repeat rough grinding, grout coat and polishing if large terrazzo chip voids exist after initial polishing.
 2. Continue grinding and polishing surface with diamond discs and pads to achieve a surface with a minimum of 70 percent aggregate exposure, and a 200 grit minimum polish.
 3. Progressively continue polishing steps with polishing pads of 220 grit 5-passes, 400 grit 5-passes, 800 grit 5-passes, until a final 800 minimum grit polish is produced. Between grits, thoroughly clean and mop slurry water. Provide and use Terrazzo and Marble Supply ET polishing pad on a Terrco 2100 machine or equivalent products.
 4. When the terrazzo floor is dry, and has been either dust mopped or vacuumed to remove any remaining dirt, a Scotch Guard or equivalent stone protector shall be applied with a micro-fiber mop and then burnished with a 3M or appropriate equivalent purple diamond pad, until proper finish is achieved. This step should be repeated twice for two coats of stone protector.

3.04 CLEANING AND PROTECTION

- A. Protection: Upon completion, the Work shall be ready for final inspection and acceptance by the owner or his agent. Provide final protection and maintain conditions, in a manner acceptable to Terrazzo Contractor, that ensure terrazzo is without damage or deterioration.
- B. Sealers and wax coating products are not required for an 800 grit finish, and are not to be applied.
- C. When needed, add back gloss by buffing with purple pads.
- D. Periodic re-application of the 3-M Stone Hardener with a fiber mop may be necessary. To restore gloss, then buffed.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

DESCRIPTION OF WORK:

Provide acoustical ceiling systems, complete as shown and as specified herein, including exposed tee suspension systems and acoustical lay-in boards.

Coordinate work with installation of air conditioning grilles and diffusers specified in Division 15B and with installation of lighting fixtures specified in Division 16.

INDUSTRY STANDARDS:

For listing of names of industry standard agencies mentioned by abbreviation in this section refer to Section 01068.

QUALITY ASSURANCE:

Manufacturers:

Standard: For purposes of designating type and quality for work in this Section, Drawings and Specifications are based on products by following manufacturers:

Ceiling Suspension Systems shall be by one of following, or equivalent by:

- Eastern Products Corp.
- Chicago Metallic Corp.
- Donn Products, Incorporated

Acoustical Tiles shall be Armstrong or equivalent products by:

- BPB
- Chicago Metallic Corp
- USG

Source: Products for use on this Project shall be of one Manufacturer for each function.

Shop Drawings: Indicate following:

Layout of inserts required for ceiling suspension system.

Reflected ceiling layouts for all areas to receive acoustical ceilings. Details of all connections to work of other trades.

Submit typical layout showing size and spacing of exposed grid and hangers as related to structural frame.

Samples: Submit samples of each acoustical unit, suspension system, and accessories.

Test Reports: Submit (in triplicate) copies of certificate of Flame Spread Class 25 rating under requirements of SS-S-118A, required for all acoustical units on Project.

Manufacturer's Data: Submit (in triplicate) Manufacturer's printed installation instructions for suspension system.

Warranty: Provide 15 year "humidity no-sag" manufacturer's warranty for tiles and grid system, warranted to replace tiles and damaged or defective system components at no cost to owner if tiles sag visibly within the warranty period. Warranty terms equivalent to Armstrong Humiguard Plus 15 year warranty.

PRODUCT HANDLING:

Delivery: Deliver acoustical ceiling boards to Project site in Manufacturer's original packages, with seals unbroken, with Manufacturer's name and contents legibly marked thereon and with testing laboratory labels where required.

Storage: Store ceiling tiles and boards in enclosed areas, with same temperature and humidity conditions as areas in which material is to be installed.

ENVIRONMENTAL CONDITIONS:

Building Conditions: Install acoustical materials only when normal temperature and humidity conditions approximate interior conditions that will exist when building is occupied. Building shall not be cold and damp, or hot and dry.

Glazing shall be in place and all exterior openings closed. All concrete, plastering and other wet work shall be complete and dry.

Provide heat and ventilation to maintain proper conditions before, during, and after acoustical work is performed.

PART 2: PRODUCTS

TYPES AND SYSTEMS: All acoustical materials shall be of types indicated by type numbers on Drawings, as follows:

Type 1: 24" x 24" x 5/8" Armstrong fine fissured Humiguard Plus, no. 1728 / Prelude XL Grid

Type 2: 24" x 24" x 5/8" Armstrong fine fissured tegular edge Humiguard Plus, no. 1732 / Prelude XL Grid

Type 3: 24" x 24" x 5/8" Vinyl faced gypsum panels / AL Prelude Plus Grid

Type 4: 5/8" Moisture resistant gypsum board on hat channels/cold-rolled channels framing system.

Type 5: 5/8" Firecode gypsum board on hat channels/cold-rolled channels framing system. Smoke resistant construction.

HANGERS:

Wire: No. 12 gauge galvanized steel.

SUSPENSION SYSTEM:

Components: System shall consist of main support tees, cross tees, splice clips, wall angles, and hold down clips.

Design Loads: Suspension system shall be designed to support respective lay-in units and light fixtures with deflection of suspension members not to exceed 1/360 of span of member.

Exposed Grid System: Armstrong Exposed Grid System (hot dipped galvanized steel), consisting of main tees and cross tees with 15/16" exposed flange. Wall molding shall be cold-rolled galvanized steel, channel shaped, with 1" exposed face of same finish as exposed tee surfaces.

Provide all aluminum grid at AL grid locations indicated.

Provide bullnosed preformed corners for bullnosed wall corners.

Finish: Exposed surfaces of tees and of wall moldings shall be flat white, baked polyester.

PART 3: EXECUTION

INSTALLATION OF ACOUSTICAL CEILING SYSTEMS:

General Requirements:

Suspension System: Install strictly according to approved Shop Drawings layouts for spaces and manufacturer's printed instructions.

Ceiling Tile Pattern, Layout, and Type:

1. Install acoustical ceiling in patterns and types indicated on approved shop drawings and, as described in this specification.
2. Unless indicated otherwise herein or on Drawings, ceilings shall be laid out symmetrically in each space, with no less than half size panels or tiles at walls.

Installation of acoustical materials and suspension systems shall be made by experienced mechanics in strict accordance with Manufacturer's written instructions.

Fit parts neatly and accurately, true to line and plane.

Where hangers fall at structural members, install hanger clips in strict accordance with written instructions of Manufacturer of hanger clips.

Suspension system, including wall mold, shall be level to within 1/8" in 12 feet, with ceiling panels in place.

Exposed grid members shall be straight and in alignment. All exposed surfaces shall be flush and level.

General Requirements for Acoustical Ceilings:

Scribe lay-in units neatly to abutting surfaces and to penetrations or protrusions.

Exercise care to prevent soiling of ceiling tiles during installation. Leave entire system neatly and accurately fitted.

CLEANING: Following installation, clean all soiled and discolored surfaces. Remove and replace units, which are damaged or improperly installed.

EXTRA STOCK: Furnish Owner 5% of each pattern of acoustical tile installed in Project for maintenance replacements.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

GENERAL:

Stone Association Publications: Comply with recommendations contained in the publications indicated below:

Submittals: With manufacturer's data and installation instructions, submit samples not less than 12" x 12" for each type, color, and finish of stonework units.

PRODUCTS:

Obtain each type of stone from one quarry, with consistent color range and texture, complying with referenced ASTM standards and other references indicated, extracted from a single bed of quarry stratum.

Bluestone Slate: Where indicated on Drawings, provide blue-gray slate window stools as detailed, exposed finished surfaces flat with natural cleft face, one long edge sandrubbed and gauged, and slightly rounded, with exposed square edges true, level and square. Equivalent to Nor-Carla Bluestone window stools by Jacob's Creek Stone Co.

Finish: Natural cleft face; dull sheen, without reflections. Color and finish to match Architect's sample. Seal stone with manufacturer's recommended sealer.

For colored pointing mortar, use ground granite or other sound stone to match Architect's sample.

Dry Set Thin-Set Mortar: ANSI A118.1

Prepackaged dry mortar mix with re-emulsifiable powder as additive, for mixing with water only.
Anchors: Nonferrous metal, as required to suit stone installations.

Fabrication: Precut stone units to required sizes and shapes. Use powered masonry saw for cutting units at site. Avoid use of less-than-half-size units.

INSTALLATION:

General: Do not use stone units with chips, cracks, voids, stains or other surface defects visible in finished work. Clean stone before setting by scrubbing with fiber brushes and water. Wet stone, as required, before setting. Comply with manufacturer's instructions for application of proprietary materials. Seal with manufacturer's recommended sealer.

Installation of Interior Wall Facing and Trim: Erect interior wall facing and trim plumb and true with joints uniform in width and accurately aligned.

Install stone to comply with requirements of referenced ANSI installation specification, and of ANSI A108.10 and TCA "Handbook for Ceramic Tile Installation", respectively, for setting bed type, TCA installation method and grout: Dry-Set Portland Cement Mortar: ANSI A108.5

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

DESCRIPTION OF WORK:

Provide FloorScore certified resilient flooring systems as indicated, complete assemblies with wall base and transitions throughout, with all necessary profiles and accessories, for all conditions, as shown on Drawings and as specified herein.

Provide rubber tile, stair tread and nosing, riser, and stringer system complete assemblies with transitions and necessary accessories, as shown on Drawings and as specified herein.

Concrete floors are specified to be finished flat and level under Division 3 requirements.

Skim coat all areas to receive resilient flooring systems complete, with self-leveling smoothing and leveling compound and prepare for installation of finish products scheduled.

At renovation conditions or replacement conditions, apply a moisture barrier primer/sealer coating to all existing concrete floor slab substrates complete.

INDUSTRY STANDARDS:

ASTM F 710-05

LEED SC, U. S. Green Building Council

FloorScore Indoor Emissions Testing Program

For listing of names of industry standard agencies mentioned by abbreviation in this section refer to Section 01068.

QUALITY ASSURANCE:

Standard: For purposes of designating type and quality for work under this Section, Drawings and Specifications are based on products by following manufacturers or approved equal:

1. Vinyl Composition Tile (VCT):
 - a. Armstrong Cork Company
 - b. Tarkett
 - c. Mannington
2. Linoleum Composition Tile (LCT):
 - a. Forbo Flooring Systems
 - b. Armstrong Cork Company
3. Linoleum Composition Sheet (LCS):
 - a. Forbo Flooring Systems
 - b. Armstrong Cork Company

4. 100% Vulcanized Thermoset Rubber Base and Accessories:
 - a. Roppe Rubber Company
 - b. Flexco Division Textile Rubber Company
 - c. Johnsonite Rubber Company

5. Rubber Tile, Stair Tread and Nosing, Riser, and Stringer system
 - a. Johnsonite Rubber Company
 - b. Roppe Rubber Company
 - c. Flexco Division Textile Rubber Company

SUBMITTALS:

Samples: Submit following samples of materials proposed for use.

Tile: Three sample tiles of each color selected.

Accessories: Three 12" lengths of each of the following:

1. Wall Base
2. Transition Edge Strip
3. Carpet Transition Stop / Reducer
4. Stair Tread and Nosing, Riser, and Stringer system
5. Self Leveling Skim Coating Material

Manufacturer's Literature: Submit (in triplicate) Manufacturer's certificates, MSDS sheets, VOC product data, and printed installation instructions on following:

- Smoothing and Leveling Compound
- Primer
- Moisture Barrier Primer/Sealer
- Adhesive
- Resilient Flooring Materials
- Rubber Base

CERTIFICATES:

Submit certification from Manufacturer of each specific resilient material assembly, listing adhesives, primers and sealers for subfloors as proposed for use in conjunction with resilient material of this Section. Manufacturer of specific resilient material shall state approval of materials to be used with his materials as listed in certification.

Submit certification from Manufacturer of adhesive for each resilient flooring assembly, approving all primers and sealers proposed for use on new and existing concrete subfloors.

Submit certification from Manufacturer of each resilient flooring material assembly, approving floor leveler and/or floor patch material proposed for use on concrete subfloors.

Submit certification from Manufacturers of each resilient flooring material assembly, approving dry-cleaner and approving non-alkaline cleaning solution proposed for use on resilient flooring.

Submit certification from Manufacturers of all resilient flooring material assemblies that products are sustainable FloorScore certified products, listing all applicable LEED credits made available by certification.

Submit certification from Manufacturers of resilient flooring adhesives are FloorScore certified products, listing all applicable LEED credits made available by certification.

PRODUCT HANDLING:

Store resilient flooring materials as packaged by Manufacturer, in undamaged condition, and with Manufacturer's seals and labels intact. Exercise care to prevent damage and freezing during delivery, handling, and storage. Store materials at Project site at least 24 hours to their installation.

ENVIRONMENTAL CONDITIONS:

Temperature: Materials and area in which materials are to be installed shall be maintained at following temperatures:

For at least 24 hours before installation of material, and continuing for at least 48 hours after installation, maintain temperature at not less than 70 degrees F. to not more than 90 degrees F.

Maintain minimum temperature of 55 degrees F after flooring is installed.

PROTECTION:

Close spaces to traffic in which all resilient flooring is being set and to other work until flooring is firmly set. Where solvent-based adhesives are used, provide safety spark-proof fans and operate. Natural ventilation is inadequate. Smoking shall be prohibited.

MAINTENANCE MANUALS: Provide 3 copies of maintenance manuals for all resilient flooring describing maintenance procedures.

PART 2: PRODUCTS

SMOOTHING AND LEVELING COMPOUND:

Smoothing and leveling compound, provide complete on all concrete subfloors scheduled for resilient flooring systems. Ardex SD-L or equivalent self-leveling product as approved by flooring Manufacturer.

PRIMER:

Primer, where required for concrete subfloors, shall be as recommended by adhesives and flooring Manufacturer.

Moisture barrier primer/sealer, required for all existing concrete subfloors, shall be as recommended by adhesives and flooring Manufacturer.

ADHESIVES:

Low emitting adhesive for cementing resilient flooring materials to sub-floors shall be as approved by flooring Manufacturer.

High moisture level rated adhesive for all existing concrete subfloors, for cementing resilient flooring materials to existing sub-floors shall be as approved by flooring Manufacturer.

Low emitting adhesive for wall base shall be as recommended by base Manufacturer.

All adhesives VOC content shall be less than 50g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).

All adhesives shall comply with requirements of the South Coast Air Quality Management District (SCAQMD) Rule #1168.

VINYL COMPOSITION TILE (VCT):

Provide Vinyl Composition Tile (VCT) where indicated on Drawings.

Vinyl Composition Tile:

Provide 12 inch by 12 inch 1/8 inch thick, Class 2 thru chip color, Composition 1, Standard EXCELON by Armstrong World Industries.

Resilient flooring of each color and pattern selected in any one area shall be from same lot.

Colors will be selected from Manufacturer's standard colors and patterns of series specified. Up to three accent colors, selected from manufacturer's standard colors, may be selected in a standard block pattern as directed by Architect for each space.

Slip Retardant Resilient Tile Flooring:

Provide Slip-Retardant Tile where indicated on Drawings, and at all interior ramps.

Provide SAFETY ZONE™ Slip-Retardant Tile Flooring manufactured by Armstrong World Industries, Class 2 thru chip color , in minimum of 2 colors selected from manufacturer's standard colors, 1/8 inch, 12 inch x 12 inch, composed of polyvinyl chloride resin binder, plasticizers, fillers, pigment, and grit. Tile shall have a nominal 0.020 inch thick pattern layer containing aluminum oxide grit.

Slip retardant vinyl composition tile properties shall meet size, thickness, indentation, impact, deflection, dimensional stability, resistance to chemicals, squareness, and resistance to heat requirements of ASTM F 1066.

Slip retardant vinyl composition tile shall meet or exceed property ranges suggested by the American with Disabilities Act, and where an added measure of safety is desired.

LINOLEUM COMPOSITION TILE (LCT):

Provide Linoleum Composition Tile (MCT) where indicated on Drawings.

Linoleum Composition Tile:

Provide 13 inch by 13 inch .080 inch thick, thru chip color, Marmoleum Dual Tile manufactured by Forbo Flooring Systems. Wear layer shall be composed of linseed oil, rosin binders, wood flour, limestone, and

dry pigments, comprising a through-grain pattern and color uniformly dispersed throughout the entire thickness, on a polyester backing. Factory applied finish shall be a high performance UV cured double layer equivalent to Topshield2. Meeting or exceeding requirements set forth in ASTM F 2195 "Standard Specification for Linoleum Tile Flooring Type 1."

Resilient tile flooring of each color and pattern selected in any one area shall be from same lot.

Colors will be selected from Manufacturer's standard colors and patterns of series specified. Up to three accent colors, selected from manufacturer's standard colors, may be selected in a standard block pattern as directed by Architect for each space.

LINOLEUM COMPOSITION SHEET (LCS):

Provide Linoleum Composition Sheet (MCS) where indicated on Drawings.

Linoleum Composition Sheet:

Provide Linoleum Homogeneous Sheet Flooring products, Marmoleum Real manufactured by Forbo Flooring Systems, 79 in. wide, having a nominal total thickness of 0.080 in. (2.0 mm), on a natural jute backing. The wear surface shall be composed of linseed oil, rosin binders, wood flour, limestone, and dry pigments, comprising a through-grain pattern and color uniformly dispersed throughout the entire thickness. Factory applied finish shall be a high performance UV cured double layer equivalent to Topshield2. The design shall merge subtle color accents with a detailed, terrazzo-like image providing a monolithic appearance. Linoleum sheet flooring shall meet or exceed ASTM F 2034 "Standard Specification for Linoleum Sheet Flooring Type 1."

Colors will be selected from Manufacturer's standard colors and patterns of series specified. Up to three accent colors, selected from manufacturer's standard colors, may be selected in a pattern as directed by Architect for each space.

Provide solid color or patterned heat welding rod as produced by Forbo Flooring Systems, and intended for heat welding of seams. Color shall match with field color of flooring sheet.

Where indicated on Drawings, provide manufacturer's flash coving complete assembly, with all required accessories.

RESILIENT BASE:

Provide Rubber Wall Base where indicated on Drawings.

100% Vulcanized Rubber Base:

ASTM F 1861, Type TS, Group 1

Set cove type rubber base on hard surfaces and carpet flooring, 1/8" thick, 4" high at all locations. Manufactured by Roppe Rubber Co. or equivalent. Vinyl or part vinyl composition is not acceptable.

Color: BLACK

Provide pre-molded external and internal corners.

Provide pre-molded end stops.

TRANSITION / REDUCER EDGE STRIPS:

Provide complete terminations at all type flooring transitions, to include all perimeters and terminations of all sports flooring, such as rubber or PVC sports flooring to VCT or polished concrete, carpet to VCT, VCT or carpet to sealed or polished concrete. Vinyl thickness to match resilient flooring thickness.

Provide transitions where non-level flooring surfaces meet or terminate. Must comply ADA Guidelines. Height to be coordinated with floor finishes thicknesses.

REDUCER STRIP: 1-1/4" wide with beveled edge, Johnsonite RRS-XX-D or equal. Color selected by Architect.

CARPET-TO-VCT TRANSITION STRIP: Johnsonite CTA-H adapter, color selected by Architect.

STAIR TREAD, RISER, STRINGER AND INTERMEDIATE LANDING TILE SYSTEM:

Rubber stairwell intermediate landings shall be Johnsonite or equivalent Landing Tiles with a .187 thick diamond surface, overall size 24" x 24", color to be selected from manufacturer's standard colors. Provide where indicated.

Where scheduled, provide raised profile one piece stair tread and riser combination, shall be Johnsonite or equivalent VIRTR (for visually impaired) with a 2" wide contrasting strip of carborundum at the nose of the tread. Treads to have a tapering thickness gauge of .210" to .153" across a 13" tread width with a 7" integral riser, with a square nose and 2" hinged drop to accommodate riser angle. Provide matching rubber stringers. Color to be selected by Architect.

STAIR TREAD NOSING:

At stair treads or floor risers receiving VCT, provide profile of nosing that applies to and conforms to the actual stair tread/riser profile, Roppe No. 1 Commercial Stair Nosing or equivalent. Apply rubber base to face of stair riser or floor to conceal face of riser surface.

Provide Roppe #5 Domestic Stair Nosing at Media Center Story Telling Bleachers carpet edge transitions.

PART 3: EXECUTION

CONDITION OF SURFACES:

Requirements: Surfaces to receive resilient flooring shall meet minimum requirements established by ASTM F 710-05 and Manufacturer of flooring. Do not start work until defects have been corrected.

Obtain Architect's representative inspection of substrate prior to application of adhesives and tiles. Do not start work or continue work until inspection items have been corrected.

Tolerances: Subfloor surfaces shall not vary more than $\pm 1/8"$ in any ten-foot dimension. Neither shall they vary at rate greater than $1/16"$ per running foot. Unacceptable conditions shall be corrected by General Contractor.

APPLICATION OF SMOOTHING AND LEVELING COMPOUND:

Apply to cover substrate completely, wall to wall. Pour mixed compound onto substrate and steel trowel and/or float to spread. Upon full cure, sand off entire surface and vacuum all areas.

APPLICATION OF PRIMER:

Apply primer/sealers to cover substrate completely. Apply at rate recommended by Manufacturer of resilient flooring.

APPLICATION OF ADHESIVE:

Mix and apply adhesive in accordance with Adhesive Manufacturer's installation instructions. Cover surface evenly with adhesive. Area covered by one application of adhesive shall not exceed maximum working area recommended by Manufacturer. Install resilient flooring within time limits recommended by Manufacturer. If adhesive films over or dries, it shall be removed and area shall be recoated.

INSTALLATION OF RESILIENT TILE FLOORING:

Lay resilient flooring true, level; and with tight, aligned joints, roll flooring in accordance with Manufacturer's directions to assume intimate contact and proper adhesion. Cut resilient flooring to and around permanent cabinets and fixtures.

Align joints with room axis. Center tile work between walls. Except as required in irregularly shaped spaces, no tile shall be less than one half tile width. Lay tile with grain in direction or pattern as directed by Architect.

Obtain Architect's representative inspection of VCT tile installation during installation phases. Do not start work or continue work until inspection items have been corrected.

INSTALLATION OF BASE:

Cement base firmly to wall. Joints shall be tight. Base (throughout its entire length) shall have top and bottom edges in firm contact with walls and finish floors. Form internal and external square corners and end stops from pre-formed units. Scribe base accurately to trim.

Wrap rubber base continuous around bullnose CMU corners.

Wrap rubber base continuous around bullnose drywall corners.

Provide pre-formed external corners at square drywall external corners.

INSTALLATION OF EDGE STRIPS:

Install edge strips as required at doors and at other locations to provide transition from all finish flooring types to other floor or surface area transitions of dissimilar materials.

CLEANING:

Immediately upon completion of stairwell rubber tile and tread system, clean floors and adjacent surfaces with cleaner approved by Manufacturer. Remove surplus adhesive and other soiling. Rinse thoroughly with clean, cold water.

Stripping and Waxing VCT:

After cleaning, strip to remove manufacturer's factory protectorant coat. Then wax and polish floors, minimum of 5 coats, with a high speed buffer, using wax recommended by School Maintenance Department. Inspect polished surfaces for defects underneath tiles, visible tile deformations and replace defective tiles and re-wax and buff as required.

EXTRA STOCK: Furnish Owner 5% quantity in unopened boxes of tile of each color and pattern installed, to be used in maintenance replacements.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

DESCRIPTION OF WORK:

Extent of painting work is shown on drawings and schedules, and as herein specified.

The work includes painting and finishing of interior and exterior exposed items and surfaces throughout project, except as otherwise indicated.

Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of work.

"PAINT" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

Paint all exposed surfaces, unless otherwise noted, whether or not colors are designated in "schedules", except where natural finish of material is specifically noted as a surface not to be painted. Where items or surfaces are not specifically mentioned, paint same as adjacent similar materials or areas. If color or finish is not designated, Architect will select these from standard light colors available for materials systems specified. Where indicated, "accent" colors are medium to deep shades, which shall require no more than one additional paint coat.

Following categories of work are not included as part of field-applied finish work, or are included in other sections of these specifications.

Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, miscellaneous metal, hollow metal work, and similar items. Also, for fabricated components such as architectural woodwork, wood casework, and shop-fabricated or factory-built mechanical and electrical equipment or accessories.

Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer finishing is specified for such items as (but not limited to) metal toilet enclosures, prefinished partition systems, acoustic materials, architectural woodwork and casework, finished mechanical and electrical equipment including light fixture, switchgear and distribution cabinets, elevator entrance frames, doors and equipment.

Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

SUBMITTALS:

Product Data: Submit manufacturer's technical information including paint label analysis and application instructions for each material proposed for use.

Samples: Submit samples for Architect's review of color and texture only. Provide a listing of material and application for each coat of each finish sample.

On 12"x12" hardboard, provide sample of each color and material, with texture to simulate actual conditions. On CMU face shell, provide sample of each color and material, with texture to simulate actual

conditions Resubmit samples as requested by Architect until acceptable sheen, color, and texture is achieved.

Wall Mockup: Paint 10'x10' section of wall with permanent lighting illumination for Architect's review and approval, prior to ordering paint materials.

Epoxy Paint Product Data: Epoxy paint manufacturer shall provide documentation that the epoxy product is tested and approved for application in such locations and for application on the surface material that is being used, and use is in compliance 2012 NC Building Code Sections 1210.2 and 1210.3; and in compliance with 2012 Plumbing code Sections 419.3 and 417.4.1 for providing smooth, hard non-absorbent surfaces adjacent to urinals and water closets and shower heads.

DELIVERY AND STORAGE:

Deliver materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label, and following information:

- Name or title of material
- Fed. Spec. number, if applicable
- Manufacturer's stock number and date of manufacturer
- Manufacturer's name
- Contents by volume, for major pigment and vehicle constituents
- Thinning instructions
- Application instructions
- Color name and number

JOB CONDITIONS:

Apply water-base paints only when temperature of surfaces to be painted and surrounding air temperatures are between 50 degrees F (10 degrees C) and 90 degrees F (32 degrees C), unless otherwise permitted by paint manufacturer's printed instructions.

Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding air temperatures are between 45 degrees F (7 degrees C) and 95 degrees F (35 degrees C), unless otherwise permitted by paint manufacturer's printed instructions.

Do not apply paint in snow, rain, fog or mist; or when relative humidity exceeds 85%; or to damp or wet surfaces; unless otherwise permitted by paint manufacturer's printed instructions.

Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.

PART 2: PRODUCTS

COLORS AND FINISHES:

Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.

Paint Coordination: Provide finish coats which are compatible with prime paints used. Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates.

Federal Specifications establish minimum acceptable quality for paint materials. Provide written certification from paint manufacturer that materials provided meet or exceed these minimums.

Provide undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer, and use only within recommended limits.

EXTERIOR PAINT SYSTEMS:

A. METAL - (Galvanized)

1. Acrylic Systems

a. Gloss Finish

- i. Surface Preparation: Refer to Part 3 Surface Preparations of these specifications for Cleaning & Testing/Evaluations; Manufacturer's guidelines and recommendations stand as requirements of this work.
- ii. 1st Coat: S-W Pro-Cryl Universal Primer, B66-310 Series (10 mils wet, 4.0 mils dry film thickness)
- iii. 2nd Coat: S-W Sher-Cryl HPA High Performance Acrylic, B66-300 Series (10 mils wet, 4 mils dry film thickness)
- iv. 3rd Coat: S-W Sher-Cryl HPA High Performance Acrylic, B66-300 Series (10 mils wet, 4 mils dry film thickness)

B. METAL - (Misc. Iron, Ornamental Iron, Catwalks, Fire Escapes, Hydrants, Handrails, Ladders, Fences)

1. ACRYLIC Systems

a. Gloss Finish

- i. Surface Preparation: Manufacturer's guidelines and recommendations stand as requirements of this work
- ii. 1st Coat: S-W Pro-Cryl Universal Primer, B66-310 Series (10 mils wet, 4.0 mils dry film thickness)
- iii. 2nd Coat: S-W Pro Industrial Multi-Surface Acrylic, B66-500 Series
- iv. 3rd Coat: S-W Pro Industrial Multi-Surface Acrylic, B66-500 Series (4 mils wet, 2 mils dry per coat)

C. METAL - (Shop Primed Metal Doors and Frames/ Panels, etc.)

1. Acrylic Systems

a. Gloss Finish

- i. Surface Preparation: Manufacturer's guidelines and recommendations stand as requirements of this work
- ii. 1st Coat: S-W Pro Industrial Multi-Surface Acrylic, B66-500 Series
- iii. 2nd Coat: S-W Pro Industrial Multi-Surface Acrylic, B66-500 Series (4 mils wet, 2 mils dry per coat)

INTERIOR PAINT SYSTEMS

A. MASONRY - (Walls & Ceilings, Poured Concrete, Precast Concrete, Unglazed Brick, Cement Board)

1. Acrylic Enamel Systems

a. Semi-Gloss Finish

- i. 1st Coat: Block filler, tinted with coats as required to fill pits and pores.
- ii. 2nd Coat: S-W Pro-Classic Waterborne Acrylic, B31W51 Series
- iii. 3rd Coat: S-W Pro-Classic Waterborne Acrylic, B31W51 Series (4 mils wet, 2 mils dry per coat)

B. PRECAST CONCRETE UNITS (Pre-Cast Concrete Benches, Caps, Decorative Items)

1. Acrylic Systems

b. Low Luster Finish

- i. 1st Coat: S-W H&C Etching Solution or muriatic acid.
- ii. 2nd Coat: S-W H&C Shield Plus Ultra Acrylic Concrete Stain
- iii. 3rd Coat: S-W H&C Shield Plus Ultra Acrylic Concrete Stain

C. WET AREAS - (All Toilets and Restrooms CMU walls, Gypsum Board Walls and Ceilings, All Shower Wall and Ceilings, High Moisture Areas). NOTE: Epoxy paint manufacturer shall provide documentation that the epoxy product is tested and approved for application in such locations and for application on the surface material that is being used.

1. Epoxy Systems

a. Gloss Finish

- i. 1st Coat CMU: S-W PrepRite Block Filler, B25W25 (tinted and rolled in to fill all pits and pores completely, as required)
- ii. 1st Coat Gyp. Bd.: S-W PrepRite Classic Latex Primer, B28W101 (4 mils wet, 1.2 mils dry)
- iii. 2nd Coat: S-W Water Based Catalyzed Epoxy, B73-300 Series (8 mils wet, 4 mils dry)
- iv. 3rd Coat: S-W Water Based Catalyzed Epoxy, B73-300 Series (8 mils wet, 4 mils dry)

D. FOOD SERVICE AREAS - (Food Service CMU Walls, Food Service Plastered Walls, Ceilings, Poured Concrete, Precast Concrete, Unglazed Brick, Cement Board) (See Special Preparations and Special Application requirements)

1. Acrylic Enamel Systems

c. Semi-Gloss Finish

- i. 1st and 2nd Coat: S-W PrepRite Block Filler, B25W25 (tinted and rolled in twice to fill all pits and pores completely, as required)
- ii. 3rd Coat: S-W Pro-Classic Waterborne Acrylic, B31W51 Series
- iii. 4th Coat: S-W Pro-Classic Waterborne Acrylic, B31W51 Series (4 mils wet, 2 mils dry per coat)

E. CONCRETE FLOORS – (Shop Floors, Utility Platforms, Custodial Spaces, Stairwells, Equipment Rooms, Boiler Rooms).

1. Urethane Systems

a. Gloss Finish (clear or colored as selected by Architect)

- i. 1st Coat: Pressure wash
- ii. 2nd Coat: S-W Armorseal Rexthane I, B65-60 Series
- iii. 3rd Coat: S-W Armorseal Rexthane I, B65-60 Series (shop floors with anti-slip additive)

F. METAL - (Structural Steel Columns, Joists, Trusses, Beams, Miscellaneous Structural Steel Members, Miscellaneous & Ornamental Iron, Sashes, Doors, Door Frames, Partitions, Cabinets, Lockers, Radiators, Wall Louvers, Pumps, Motors, Machines, Convector, Ducts [Ventilating], Electrical Raceways & Conduits, Elevator Cabs, Copper, Non-Galvanized Metal)

1. Acrylic Systems

a. Gloss Finish

- i. 1st Coat: S-W Pro-Cryl Universal Primer, B66-310 Series (10 mils wet, 4.0 mils dry film thickness)
- ii. 2nd Coat: S-W Pro Industrial Multi-Surface Acrylic, B66-500 Series
- iii. 3rd Coat: S-W Pro Industrial Multi-Surface Acrylic, B66-500 Series (4 mils wet, 2 mils dry per coat)

2. Dryfall Alkyd Systems (EXPOSED STRUCTURE WHERE SCHEDULED)

a. Gloss Finish (Flat Black in Auditorium, Stage)

- i. 1st Coat: S-W Kem Bond HS Metal Primer, B50Z Series (8 mils wet, 5 mils dry)
- ii. 2nd Coat: S-W Waterborne Acrylic Dry Fall, B47W65 (8 mils wet, 4 mils dry)

- iii. 3rd Coat: S-W Waterborne Acrylic Dry Fall, B47W65 (8 mils wet, 4 mils dry)

G. METAL - (Galvanized)

2. Acrylic Systems

d. Gloss Finish

- i. Surface Preparation: Refer to Part 3 Surface Preparations of these specifications for Cleaning & Testing/Evaluations; Manufacturer's guidelines and recommendations stand as requirements of this work.
- ii. 1st Coat: Pro-Cryl Universal Primer, B66-310 Series (10 mils wet, 4.0 mils dry film thickness)
- iii. 2nd Coat: S-W Pro Industrial Multi-Surface Acrylic, B66-500 Series
- iv. 3rd Coat: S-W Pro Industrial Multi-Surface Acrylic, B66-500 Series (4 mils wet, 2 mils dry per coat)

H. WOOD - Walls, Ceilings, Doors, Trim, Cabinet Work, Counters, Partitions, Frames [Including Sitka Spruce, Southern Pine, Douglas Fir, Cedar, Redwood, Lauan]

1. Stained & Varnished (Clear Finish)

a. Open Grained Wood

- i. 1st Coat: S-W Interior Oil Stain, A48 Series
- ii. 2nd Coat: S-W Sher-Wood Natural Filler, D70T1
- iii. 3rd Coat: S-W Oil Base Varnish, Gloss A66V91
- iv. 4th Coat: S-W Oil Base Varnish, Gloss or Satin A66 Series

b. Closed Grain Wood

- i. 1st Coat: S-W Interior Oil Stain, A48 Series
- ii. 2nd Coat: S-W Oil Base Varnish, Gloss A66V91
- iii. 3rd Coat: S-W Oil Base Varnish, Gloss or Satin A66 Series (4 mils wet, 1.5 mils dry per coat)

I. WOOD - (Floors-Painted, Stained, Varnished, Gym Floors [New], Stage Floors, Heavy Duty Ballroom, Convention, Etc.)

1. Polyurethane Varnish System

a. Gloss Finish (Low Lustre Satin Sheen For Stage Flooring)

- i. 1st Coat: S-W Oil Stain (Ebony Stain for Stage Flooring)
- ii. 2nd Coat: S-W Polyurethane Varnish, A67V1/A67F1

- iii. 3rd Coat: S-W Polyurethane Varnish, A67V1/A67F1 (4 mils wet, 1.5 mils dry per coat)
- J. NON-TEXTURED SMOOTH DRYWALL (Walls, Ceilings, Gypsum Board, Wood Pulp Board, Plaster Board, Etc.)
- 3. Acrylic Enamel Systems
 - a. Base Coat: SHEETROCK Brand First Coat (for equalizing textures)
 - b. Semi-Gloss Finish (UNLESS NOTED OTHERWISE)
 - v. 1st Coat: S-W PrepRite Classic Latex Primer, B28W101 (4 mils wet, 1.2 mils dry)
 - vi. 2nd Coat: S-W Pro-Classic Waterborne Acrylic, B31W51 Series
 - vii. 3rd Coat: S-W Pro-Classic Waterborne Acrylic, B31W51 Series (4 mils wet, 2 mils dry per coat)
- K. TEXTURED DRYWALL (Walls, Ceilings, Gypsum Board, Wood Pulp Board, Plaster Board, Etc.)
- 4. Acrylic Enamel Systems
 - a. Semi-Gloss Finish
 - i. 1st Coat: S-W PrepRite Classic Latex Primer, B28W101 (4 mils wet, 1.2 mils dry)
 - ii. 2nd Coat: S-W Pro-Classic Waterborne Acrylic, B31W51 Series
 - iii. 3rd Coat: S-W Pro-Classic Waterborne Acrylic, B31W51 Series (4 mils wet, 2 mils dry per coat)
- L. CANVAS PIPE WRAP (exposed to view)
- 1. Latex Systems
 - a. Flat Finish
 - i. 1st Coat: S-W PrepRite 200 Latex Primer, B28W200 (add fungicidal agent) (4 mils wet, 1.2 mils dry)
 - ii. 2nd Coat: S-W ProMar 200 Latex Flat B30W200 Series (4 mils wet, 2 mils dry)
 - iii. 3rd Coat: S-W ProMar 200 Latex Flat B30W200 Series (4 mils wet, 2 mils dry)

PART 3: EXECUTION

INSPECTION:

Applicator must examine areas and conditions under which painting work is to be applied and notify Contractor in writing of conditions detrimental to proper and timely completion of manner acceptable to Applicator.

Starting of painting work will be construed as Applicator's acceptance of surfaces and conditions within any particular area.

Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

SURFACE PREPARATION:

General: Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions, SSPC-SP, and as herein specified, for each particular substrate condition.

SSPC-SP: Steel Structures Paint Council Surface Preparation Specification No. #

Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly-painted surfaces.

Wood: Clean wood surfaces to be painted. Remove dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view, and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.

Ferrous Metals: Clean ferrous surface, which are not galvanized or shop-coated, of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.

Touch-up shop-applied primed coats wherever damaged or bare, where required by other sections of these specifications. Clean and touch-up with same type shop primer.

Galvanized Surfaces:

Hot-Dipped Galvanizing: Allow hot-dipped galvanized items to weather 6 months prior to surface preparations, and then steam clean per SSPC-SP 1. Do not use hydrocarbon solvents, vinegar or other mild acids for cleaning hot dipped galvanized surfaces. After cleaning, perform spot testing for any manufacturer's pre-treatments, using the procedure from ASTM D2092, Method B201, Volume 06.01. After pre-treatments testing, apply 2' x 2' paint test patch for evaluation of paint surface adhesion. Evaluate the adhesion at three locations of the surface area, by performing a tape adhesion test per ASTM Method D3359. Grade the tape adhesion of the coating by following ratings as set forth in ASTM D3359-97.

Galvalume: Clean free of grease, oil, dirt, soil, and other surface contaminants with hydrocarbon free solvent cleaner. Perform a light brush blasting per SSPC-SP7 if necessary. After cleaning, apply 2' x 2' paint test patch for evaluation of paint surface adhesion. Evaluate the adhesion at three locations of the surface area, by performing a tape adhesion test per ASTM Method D3359. Grade the tape adhesion of the coating by following ratings as set forth in ASTM D3359-97.

Special Food Service Area Wall Preparation: Special preparation will be required to assure that required Food Service area CMU wall surfaces are pointed and patched is in strict accordance with the drawing's CMU surface preparation General Notes for on-site approval by local Health Department. All work resulting from inspection comments and requirements are to be provided at no additional cost.

Previously Coated Surfaces:

Maintenance painting will frequently not permit or require removal of old coatings prior to repainting. However, all surface contaminants such as oil, grease, loose paint, mill scale, dirt, foreign matter, rust, mold, mildew, efflorescence, and sealers must be removed to assure sound bonding to the tightly

adhering old paint. Glossy surfaces of old paint films must be clean and dulled before repainting. Thorough washing with an abrasive cleaner will clean and dull in one operation, or wash thoroughly and dull by sanding. Spot prime any bare areas with appropriate primer. Check for compatibility by applying a test patch of the recommended coating system, covering at least 2 to 3 square feet. Allow to dry one week before testing adhesion per ASTM D3359. If the coating system is incompatible, report findings to Architect.

Existing Stained Wood:

Wood must dry and cleaned of dirt, grease, wax, polish, and marks. Old finishes in poor condition should be completely removed and the surface treated as a new surface. Sand wood to a smooth surface with 100-120 grit paper. Remove sanding dust with a vacuum or tack cloth. Avoid sanding wood that has only stain on it, sanding will remove some of the stain creating an uneven appearance. Sand down bare spots and scratches, and stain to match adjacent color. Very lightly scuff sand between finish coats, 180 grit paper or finer, removing any raised graining. Perform adhesion testing, identifying any presence of any sanding sealer, which can prevent bonding and cause peeling.

LEAD-BASED PAINT RENOVATION, REPAIR, AND PAINTING:

Applicators who perform painting renovations in housing or child occupied facilities built before 1978 must be certified by the Health Hazards Control Unit (HHCU). All work shall comply with requirements as published by the EPA Lead-Based Paint Renovation, Repair and Painting Rule in the Code of Federal Regulations.

Samples: For determining whether components are free of lead-based paint, certified applicators may collect paint chip samples and submit samples to a laboratory recognized by NLLAP for analysis. Required paint chip samples documentation shall be prepared and maintained by the certified applicator for three years.

MATERIALS PREPARATION:

Mix and prepare painting materials in accordance with manufacturer's directions.

Stir materials before application to produce a mixture of uniform density, and stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

APPLICATION:

General: Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to insure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

Special Food Service Area Wall Application: Roll-in two coats of masonry block filler coating in Food Service areas as necessary to completely fill all pits and pores prior to application of top coats. Final finished topcoat in Food Service areas to be free of all pits and pores, with a smooth completely washable surface. Apply additional coats when final coat of paint does not uniformly fill all pits and pores. Provide all work described as necessary to obtain an on-site approval by local Health Department.

Finish exterior doors on tops, bottoms and side edges same as exterior faces, unless otherwise indicated.

Sand lightly between each succeeding enamel or varnish coat.

Omit first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise indicated.

Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to those items exposed in occupied spaces.

Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

CLEAN-UP AND PROTECTION:

Clean-Up: During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each work day.

Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

Protection: Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.

Provide "Wet Paint" signs as required to protect newly-painted finishes. Remove temporary protective wrappings provided by others by protection of their work, after completion of painting operations.

At the completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

EXTRA STOCK:

Furnish extra paint in manufacturer's sealed shipping containers. Provide one gallon for each type and color of paint applied in the project. Containers shall only be opened by the painter manufacturer/supplier to formulate required colors/mixes. These extra materials shall not be opened or used by the Contractor without written permission from the Owner. Place a label, protected by clear plastic on the lid of each container with the following typewritten information:

1. Paint Manufacturer
2. Product name and number
3. Mixing and color formulation
4. Painting contractor
5. Date that the paint container is put in the Owner's inventory
6. Room or area number where the paint applied was used

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

DESCRIPTION OF WORK:

Work of this Section shall be to provide and install all building interior and building exterior signs, exterior building letters, dedication plaques and to provide for the purchase of building equipment as determined by the Owner. Sign letters and equipment indicated shall be purchased and installed with the allowance specified in 01056 Allowances, to include tax and freight, but not to include labor or installation, except as specifically stated below. Signs and equipment shall be installed by the Contractor in accordance with manufacturer's recommendations.

INDUSTRY STANDARDS:

For listing of names of industry standard agencies mentioned by abbreviation in this Section, refer to Section 01068.

SUBMITTALS:

Manufacturer's Data: Submit for approval three (3) copies of folder containing complete Manufacturer's data and installation procedures for all products to be used in work of this Section.

Shop Drawings: Submit Shop Drawings in compliance with GENERAL CONDITIONS. These drawings shall be coordinated with adjacent work.

PART 2: MATERIALS

PRODUCTS: (final total list of equipment to be final approved by the Owner)

Interior Signage (installed): Interior signage shall be solid one piece phenolic plastic materials, sand etched raised graphics, attached to walls with (4) screws each, ADA compliant. Provide Mohawk Signs Series 200A Sand Etched Format D signs or equivalent by Best Signs.

Evacuation Plan Holders: Clear polycarbonate plastic, wall mounted with 2 screws.

Building Equipment as determined by the Owner.

PART 3: EXECUTION

PRODUCT HANDLING:

Working Areas: Provide suitable areas for storage of materials and equipment.

Delivery: Deliver products to site in original sealed containers or packages bearing Manufacturer's name and brand designation.

INSPECTION

Examine all surfaces to which products are scheduled to be installed. If unsatisfactory conditions exist, report to General Contractor and do not proceed with work until conditions have been satisfactorily corrected.

INSTALLATION:

Install signs in accordance with Manufacturer's printed instructions and Shop Drawings, approved by Architect. Signs to be located with leading edge 10" from pull edge of door, center 60" above floor.

All installations shall be performed by capable workmen under direction of foreman fully qualified by experience in each respective field of installation work.

Install all equipment per processed product submittals and written manufacturer's installation instructions.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1: GENERAL

DESCRIPTION OF WORK:

Provide fire extinguisher cabinets and extinguishers as shown on drawings and specified herein. Provide cabinets for all extinguishers except as noted.

QUALITY ASSURANCE:

Manufacturers: Fire extinguisher cabinets and extinguishers of following manufacturers, which meet all requirements of these Specifications and approved equal products by other manufacturers, will be acceptable for use on this Project:

Fire Extinguisher Cabinets

- Norris Industries
- J. L. Industries
- Larsen's Mfg. Co.

Fire Extinguishers

- Amerex Fire Extinguishers

SUBMITTALS:

Shop Drawings: Submit to Architect in quadruplicate Shop Drawings for approval of all items specified herein in accordance with General Conditions.

PART 2: PRODUCTS

Fire Extinguisher cabinets shall be "Clear Vu Series" model 1536G25, semi-recessed, with full clear acrylic bubble door and SAF-T-LOK feature, Fire Rated at fire-rated walls, white powder coated steel tub, stainless steel door and trim finish, as manufactured by JL Industries or approved equal. Cabinet shall accommodate and include an Amerex 10 pound, Class ABC Multi-Purpose Dry-Chemical fire extinguisher, Model 10 lb. B456, unless otherwise noted.

Furnish 10 pound, Amerex Class ABC extinguishers with wall mount bracket in each Custodian Room.

Furnish 10 pound, Amerex Class ABC extinguishers with wall mount bracket in each Equipment Platform where indicated.

Furnish 2.5 gallon Amerex Model B262 Class K wet chemical extinguishers in cabinets in Kitchen, in model 2536G25 cabinet.

Furnish one (1) 5 pound, Amerex Model B386T Halotron extinguisher in each Computer Lab and/or each Electronics Lab.

Furnish one (1) each 10 pound, Amerex Model 330 Class BC carbon dioxide extinguishers with wall mount bracket in Electrical and Boiler/Mechanical Rooms, no cabinet.

PART 3: EXECUTION

INSTALLATION:

Install fire extinguisher cabinets in accordance with Manufacturer's written instructions, Catalog Cuts approved by Architect, and locations pre-approved by local fire official.

END OF SECTION

RELATED DOCUMENTS:

The general provisions of the Contract, including General and Supplementary Conditions, and General Requirements, and Division 1 specifications that apply to the work specified in this Section.

PART 1 - GENERAL

DESCRIPTION OF WORK:

Work of this Section shall include furnishing all labor and materials required to provide all Dining Room furnishings and furniture as specified herein, and as indicated on Drawings, and located the arrangement indicated on Drawings.

Furnish and install the following:

Dining Room Furniture

INDUSTRY STANDARDS:

For listing of names of industry standard agencies mentioned by abbreviation in this section refer to Section 01068.

QUALITY ASSURANCE:

Manufacturers:

Standard: For purposes of designating type and quality for work under this Section, Drawings and Specifications are based on products manufactured or furnished by Manufacturer's listed products.

SUBMITTALS:

Manufacturer's Data: Submit for approval complete Manufacturer's data and installation procedures for all items to be furnished in work of this Section of Specifications.

Product Data Submit product data for each type of furniture specified, including details of construction and relative materials, dimensions, profiles, component parts, accessories, and finishes.

Shop Drawings: Submit for each specialty item specified in accordance with General Conditions.

Samples: 6-inch by 6-inch samples of each exposed finish required, including woods, HPL, and upholstery fabrics.

Should samples of items be requested by the Architect or Owner prior to release they must be made available for inspection within 10 working days.

Samples may be required from prospective bidders in order to determine quality of workmanship and compliance with the design and material requirements of these specifications:

- A. Corner section of tables or desks showing leg, and counter top and/or table top construction, and means of attaching legs and adjustable glide.

PART 2 - PRODUCTS

MATERIALS

FURNISHINGS SCHEDULE:

Manufacturer's products specified shall be the standard for comparison and judgment, and their specification shall apply as if included and/or written in full.

ITEM PROVIDE PRODUCT EQUIVALENT TO:

R FOLD AND ROLL TABLE 30 X 144 WITH 12 STOOLS:

KI Model No. UF 126 BNCHP4-29: 29" table height with 3/4" thick HPL top and black bullnose t-edge, mechanically fastened through the bottom, 12 stools, pneumatic cylinder fold assist, 15 year warranty, powder coated finish.

PART 3 - EXECUTION

INSTALLATION:

Install products in strict accordance with manufacturer's printed instructions. General Contractor shall coordinate requirements by other prime contractors.

END OF SECTION

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART I - GENERAL

SCOPE OF WORK:

It is the intent of these specifications to describe a complete hydraulically calculated wet pipe sprinkler system. Include all plant facilities, labor, material, equipment and service necessary for the design, fabrication and installation of the automatic sprinkler system and piping.

The contractor shall prepare all design drawings with appropriate seals and signatures for review and approval of AHJ and NC DOI. The contractors shall provide all working drawings complying with the construction documents, and Chapter 1-9 of NFPA 13 and submit them along with supporting hydraulic calculations and data sheets to the authority(s) having jurisdiction. Simultaneous submittals are acceptable if all approvals and/or comments necessary for the installation are incorporated to the work at no additional cost to the owner. A complete set of approved stamped shop drawings with comments from all authority(s) shall be forwarded to the engineer to assure compliance with project design.

The work under this section of the specifications includes all labor, materials, equipment and services necessary to complete the fire sprinkler installation as shown on the drawings and herein specified. Included shall be all shop drawings which shall be coordinated with all trades for clearance. All work to be done in a workman like manner in accordance with good practices, manufacturer's recommendations and in compliance with all State and local codes, Insurance underwriters and Authorities having jurisdiction. The Contractor shall obtain all permits and pay all related expenses. All work and equipment shall be guaranteed for one year after acceptance.

DESIGN CRITERIA:

Hydraulically designed systems shall be based on the following:

Exhibit Hall, Storage, Holding, Custodial Storage, etc. to be classed Ordinary Hazard Occupancy (Group 1) with 0.15 gpm per sq. ft. density over 1,500 sq. ft. or all the sprinklers in the room.

Offices, lobbies, corridors, etc. to be classed Light Hazard Occupancy with 0.1 gpm per sq. ft. over 1,500 sq. ft. of area operating or entire room is less area.

Centering of sprinklers in ceiling tiles is not required, however, space from center of sprinkler head to the center of grid framing shall not be less than 6 inches.

No riser shall serve a building size exceeding 52,000 ft²; per NFPA 13.

Maximum velocity in piping shall not exceed 20 fps.

Design pressure at the base of the sprinkler riser shall not exceed 50 psi.

CONDUCT OF WORK:

The Fire Sprinkler Contractor shall employ on the job at all times a competent superintendent who shall be responsible for the progress and execution of the work. Workmanship shall be of high quality, conforming to standard practice as stipulated by NFPA, ASTM and ASA recommendations, by skilled workmen during regular working hours.

REFERENCE:

All work of this section shall be governed by all provisions of the General, supplementary and Special Conditions of these specifications and drawings.

Nothing in any of the drawings or documents shall be interpreted as being contrary to law or ordinances and all codes and laws of governing agencies shall be followed as though they were herein bound.

RELATED WORK:

General: Supplementary Conditions and the following other sections apply to the work of this section.

Section 02713: Water Systems

Section 02210 - Trenching and Backfilling for Utilities

Section 15000 - General Provisions for Plumbing and HVAC

Section 16800 - Fire Alarm Systems

Not Included: Fire extinguishers

QUALIFICATIONS:

The contractor for the fire sprinkler installation shall be duly licensed by the State of North Carolina and regularly engaged in the installation of fire sprinkler systems and have at least ten (10) years experience in installing similar systems.

REGULATORY AGENCIES:

City or County Fire Marshal or appointed AHJ

City or County Code Enforcement/Building Inspections Department or appointed AHJ

Industrial Risk Insurers (or per Owner's reviewing agency)

PERMITS & FEES:

Any permits, fees, inspection and test charges, etc., required for this work shall be secured and paid for by the contractor at no extra expense to the Owner.

SUBMITTALS:

Partial submittals will not be acceptable. Descriptive data showing specific model, manufacturer, type and size of each item. If the manufacturer's catalog sheets show more than one item, the items proposed for use shall be clearly identified by means of an arrow or other specific marking.

Four copies of shop drawings for all pieces of equipment used in the system, and working plans on standard 1/8" scale in accordance with the requirements found in these specifications & NFPA 13 shall be submitted to the Architect / Engineer within forty-five (45) days after Notice to Proceed. All submittals shall be signed and sealed by the responsible designer.

After review by the Architect / Engineer the contractor shall revise the working drawings, and calculations if appropriate, addressing each design review comment, prior to submitting the working drawings to the Fire Marshal's Office for approval and permit.

Prior to the start of construction, Contractor shall provide a minimum of five (5) sets of "Working Drawings" and bearing the approval of all authorities having jurisdiction to be submitted to Architect for approval before any work is commenced.

REQUIREMENTS FOR FIRE PROTECTION SYSTEMS DESIGN AND SUBMITTAL

Information required on shop drawings includes:

Name of Owner and occupant

Location, including street address

Point of compass

Ceiling construction

Full-height cross section

Location of fire walls

Location of partitions

Occupancy of each area or room

Location and size of blind spaces and closets

Any questionable small enclosures in which no sprinklers are to be installed

Size of city main in street, pressure and whether dead end or circulating and, if dead end, direction and distance to nearest circulating main, city main test results

Other source of water supply, with pressure or elevation

Make, type and orifice size of sprinkler

Temperature rating and location of high-temperature sprinklers

Number of sprinklers on each riser and on each system by floors and total area by each system on each floor

Make, type, model and size of alarm or dry pipe valve

Make, type, model and size of preaction or deluge valve

Type and location of alarm bells

Total number of sprinklers on each dry pipe system or preaction deluge system

Approximate capacity in gallons of each dry pipe system

Cutting lengths of pipe (or center-to-center dimensions)

Type of fittings, riser nipples and size, and all welds and bends

Type and location of hangers, inserts and sleeves

All control valves, checks, drain pipes and test pipes

Small hand-hose equipment

Underground pipe size, length, location, weight, material, point of connection to city main, the type of valves, meters and valve pits; and the depth that top of the pipe is laid below grade

When the equipment is to be installed as an addition to an old group of sprinklers without additional feed from the yard system, enough of the old system shall be indicated on the plans to show the total number of sprinklers to be supplied and to make all connections clear

Name, address and phone number of Contractor and sprinkler designer

Hydraulic reference points shall be shown by a number and/or letter designation and shall correspond with comparable reference points shown on the hydraulic calculation sheets.

System design criteria showing the minimum rate of water application (density), the design area of water application and the water required for hose streams both inside and outside.

Actual calculated requirements showing the total quantity of water and the pressure required at a common reference point for each system.

Elevation data showing elevations of sprinklers, junction points and supply or reference points.

Information required on calculations includes:

Location

Name of Owner and occupant

Building identification

Description of hazard

Name and address of Contractor and designer

Name of approving agency

System design requirements include:

Design area of water application

Minimum rate of water application (density)

Area of sprinkler coverage

Hazard or commodity classification

Building height

Storage height

Storage method

Total water requirements, as calculated, including allowance for hose demand water supply information

Location and elevation of static and residual test gauge with relation to the riser reference point

Flow location

Static pressure, psi

Residual pressure, psi

Flow, gpm

Date

Time

Test conducted by whom

Sketch to accompany gridded system calculations to indicate flow quantities and direction for lines with sprinklers operated in the remote area.

Additional information necessary for complete review includes:

Sprinkler description and discharge constant (K value)

Hydraulic reference points

Flow, gpm

Pipe diameter (actual internal diameter)

Pipe length

Equivalent pipe length for fittings and components

Friction loss in psi per foot of pipe

Total friction loss between reference points

Elevation difference between reference points

Required pressure in psi at each reference point

Velocity pressures and normal pressure if included in calculations

Notes to indicate starting points, reference to other sheets or classification of data

Included with the submittal must be a graph sheet showing water supply curves and system requirements including:

Hose demand plotted on semi-logarithmic graph paper so as to present a graphic summary of the complete hydraulic calculations.

PART 2 - PRODUCTS

GENERAL:

All materials and equipment furnished by the Contractor shall be new, first grade products of current manufacture. All materials and equipment shall be approved or listed for use in automatic sprinkler systems, for the intended use. Where two or more pieces of equipment performing the same function are required, they shall be the product of one manufacturer and exact duplicates.

PIPING, FITTINGS AND SPECIALTIES:

Piping shall be standard black steel, schedule 10 or schedule 40 as approved by NFPA-13.

All fittings shall be listed or approved for the specific pipe and type of system to be installed. Standard approved cast iron sprinkler fittings and/or approved thread-o-lets or weld-o-lets, or grooved with gasket fitting are acceptable. Shop-weld thread-o-lets may be used in lieu of tee fittings, but field (site) welding will not be permitted. Screwed joints shall be made up with approved Teflon tape or pipe thread compound. Flanged joints shall be made up with suitable gaskets and machine bolts with nuts having dimensions and conforming with American Standard B18.2-1955.

Fittings used in sprinkler systems shall be of the materials listed in NFPA 13 Table 3-8.1.1 or in accordance with NFPA 13 3-8.1.2. When water pressures exceed 175 psi, extra-heavy pattern fittings shall be used.

Flexible and rigid-type grooved couplings shall be of type and manufacture approved for use in sprinkler installations. Flexible couplings shall be installed as required by NFPA 13.

Inspector's test orifices shall be sized the same as the smallest sprinkler orifice used on the system.

Fire department connection shall be horizontal type with dual clappered inlets, red plastic plugs and a sign with raised letters that reads "AUTO SPKR." Fire department connection shall be equipped with check valve as specified below.

Hangers, couplings and sway bracing shall be installed in accordance with all applicable requirements of NFPA 13 (2002), except explosive driven fasteners will not be permitted.

All welded piping must conform to all of the requirements of NFPA 13.

VALVES:

Valves to be of the approved type for their respective service.

Supervisory switches shall be approved type and uniform throughout the job.

Outside sectional valves must be Post Indicating Valves (PIV's) and should be located forty (40) feet from the exterior wall of the building, minimum, unless faced by a blank wall where a lesser distance may be acceptable.

Floor control valves shall be provided in all buildings with more than one floor and shall be a U.L. listed or Factory Mutual approved OS & Y or butterfly type valves. Valve supervisory switches shall be provided on all sprinkler system control valves. Potter OSYSU-A1 or OSYS-B. Butterfly valves may have internal or external mounted supervisory switches. External switches shall be Potter devices.

Check valves for the fire department connection (FDC) shall be swing check type, mounted horizontally and shall have rubber or composition discs.

All drain valves and test valves shall have replaceable rubber or composition discs.

SPRINKLERS:

All sprinklers shall be in accordance with NFPA 13. Sprinklers shall have 1/2 inch orifice unless approved in advance by the Fire Marshal.

All pendant sprinklers supplied by concealed piping shall be factory finish brass.

All pendant sprinklers located within seven feet (7') of the floor shall be provided with sprinkler guards.

Sprinklers shall be upright, pendant or sidewall as appropriate for the design basis, shall be located in all areas and shall be of the glass bulb type rated at 175 degrees F. Where maximum ceiling temperatures exceed those outlined in Table 3-11.6.1 of NFPA 13 (2002), sprinklers of temperature ratings appropriate for the particular conditions shall be used.

All finished spaces with lay in or gypsum ceilings shall be provided with concealed flush sprinkler heads, escutcheon color shall be selected by the architect. Unfinished spaces, gymnasiums and other spaces with open type ceiling shall be pendant type with wire guard where subject to damage.

Concealed flush sprinklers may be used as per the listing of the sprinkler. Where called for as pendant sprinklers from concealed piping, escutcheons shall be white in color (or other at Architect's option) and of the approved type. Pendant standard spray sprinklers shall utilize two (2) piece escutcheons. Escutcheons having an overall depth of 1-1/2 inch shall not be used except where it is necessary to install a sprinkler farther below the ceiling than is customary.

Extra sprinklers in the quantities required by NFPA 13 shall be provided and shall be placed within an approved cabinet which shall be located adjacent to the main riser. The cabinet shall be provided with a sprinkler wrench, or special wrench where applicable.

FIRE ALARM AND RELATED EQUIPMENT:

New exterior electric horn shall be 120 VAC-powered, Pyrotronics HAC-120, Federal 350 weatherproof, or approved equal, shall be supplied under this Section and connected under Section 16800, Fire Alarm and Detection Systems.

Vane type water flow indicators shall be Potter VSR series, or approved equal, shall include two (2) single pole double throw (SPDT) contacts, and pneumatic adjustable retard.

Pressure type waterflow indicators shall include two (2) single pole double throw (SPDT) contacts, and pneumatic adjustable retard. Waterflow indicators shall be installed under this Section and connected and adjusted under Section 16800, Fire Alarm and Detection Systems.

Valve supervisory switches shall include SPDT contacts. Butterfly valves with internal supervisory switches are acceptable. External mounted supervisory switches shall be Potter devices. Valve supervisory switches shall be installed and adjusted under this Section.

IDENTIFICATION AND LABELING:

All control, drain and test valves to be properly tagged indicating their function.

MANUFACTURERS:

Siamese Connections and Fire Department Valves
Elkhart
Grinnell
Potter-Roemer
Fittings
Grinnell
Flagg
Stockham Pipe
Sprinkler Heads
Central
Star
Grinnell
Viking

PART 3: EXECUTION

INSTALLATION:

Before installation begins, drawings and calculations for the installation of sprinklers shall be reviewed and accepted by the authorities having jurisdiction. The Contractor shall complete the installation in accordance with the project requirements and the requirements of NFPA 13. The Contractor may, at his option and expense, prepare alternate drawings for the convenience of his own fabrication and installation procedures. Installation to be in accordance with approved shop drawings.

Contractor shall determine actual project dimensions in the field and make such length and offset adjustments as may be necessary to complete the installation at no change in the contract price. Any changes in the design of the system shall be noted as such on the Drawings of Record.

Tapping, gate valves, back flow preventers, fire department connections and required check valve shall be installed on the fire service refer to Contract Drawings for additional requirements.

The Contractor shall be responsible for all openings required for sprinkler piping. Cutting structural members for passing sprinkler piping or pipe hanger fastenings will not be permitted except with written approval of the Architect.

Where piping is indicated to be installed above finished ceilings, removal and replacement of ceilings shall be the responsibility of the Contractor. Ceiling replacement materials shall match finish of adjacent ceiling areas.

Where piping passes through exterior walls or basement walls, there shall be a minimum of two inches (2") clearance around the pipe. Annular space between the piping and the adjacent construction shall be sealed watertight using an approved/listed system. Apply sealant in accordance with manufacture's instructions and the product listing.

Piping may pass partially through top of wall plates at interior partitions. Contractor shall exercise care to cut only sufficient material to allow installation of piping. Top plates shall not be cut through to allow piping to pass.

All piping shall be reamed to remove all burrs, and pipe sections shall be cleaned inside to remove all chips and foreign materials prior to making joints.

Hangers, flexible connections and seismic bracing shall be installed in accordance with the requirements of NFPA 13 (2002), including the appendices.

Split wall plates or escutcheons shall be installed where exposed piping passes through a finished floor, wall or ceiling. They shall fit snugly around piping, and shall cover the entire annular space around the piping. The finish of escutcheons or wall plates shall match the color of adjacent walls, ceiling or floors. At all fire rated floors, walls or ceilings, suitable means shall be provided at each penetration to insure effectiveness of floor or wall as a firestop.

Inspector's test valves shall be installed downstream of each water-flow device. Inspector's test outlets shall be piped to drain outside of the building or into the sewer drain. Valves shall be within six feet (6') of the floor or finished grade. When the discharge outlet cannot be seen from the valve or when inspector's test connections are piped into the sewer system, a sight glass shall be provided. Direct interconnections shall not be made between sewers and sprinkler drains (NFPA 13 sec. 3-6.4.1). Where located in finished spaces, test valves shall be located above ceiling and piping shall be concealed within walls.

Main drain connections shall discharge to the outside of the building in such a manner that a full flow from the main drain will not damage landscaping or surroundings. An acceptable drain termination is a three inch by three inch by two inch (3"x 3"x 2") bullhead "T" with three inch (3") shoulder nipples and three inch (3"), forty-five degree (45°) elbows pointed away from the building.

Install control valves, supply valves, and water flow switches in clearly accessible locations within five feet (5') of the floor.

Install fire department connection eighteen (18") inches to twenty-four inches (24") above paving or grade with twelve inch (12") clearance around all sides.

Install check valve and water flow indicators with eighteen inch (18") clearance from obstructions so that they can be removed and serviced.

Pressure gauges shall be provided at each side of the main check valve and at each control valve for each floor (where applicable).

Combustible concealed spaces shall be protected with sprinklers except as allowed by NFPA 13 sec. 4-4.4.1

All fire detection and electrical equipment shall be installed in accordance with the requirements of Section 16800, Fire Alarm and Detection Systems.

Centering of sprinklers in ceiling tiles is not required, however, space from center of sprinkler head to the center of grid framing shall not be less than 6 inches.

All work shall be coordinated with all trades.

Provide and pay for all tests required by the authorities having jurisdiction and correct any defect indicated by tests. All systems to be tested at 50 psi above maximum pressure but not less than 200 psi for a period of two (2) hours.

The contractor shall be responsible for excavations, back-filling, and compaction as well as replacement of pavement as required under this contract. Provide barricades, lights, and shoring as needed to insure safety to workmen and the public and as required by the authorities having jurisdiction.

The fire protection contractor shall assure the area is cleaned up as much as possible at the end of each working day.

PAINTING AND MARKING OF PIPING

Paint all exposed steel piping, equipment and other materials such as fittings, hangers, etc., except sprinklers, bronze or brass fittings and/or moving parts. Priming coat to be yellow zinc chromate paint conforming to Federal Specifications TT-P-86 or equal. Apply priming coats and touch up all painted areas which are nicked or scratched (such as wrench marks, etc.) to assure a complete smooth prime painted installation.

Finish paint color shall match existing finishes.

Sprinkler protective bags or wrappings shall be removed after painting is finished. All sprinklers which have any paint on them shall be replaced. Cleaning of painted sprinklers will not be allowed.

Provide pipe markers with the words "AUTO SPRINKLER" or "FIRE SPRINKLER" in minimum 2 inch high lettering to identify all system piping. Markers shall be so located so as to be easily read from the ground or floor level. Markers shall be spaced at a maximum of 25 feet between markers.

FIELD QUALITY CONTROL:

Perform flush & testing procedure as noted below.

FLUSHING:

Underground main piping shall be flushed prior to connection to the sprinkler riser. Flushing shall be performed in accordance with the requirements of NFPA 13 (1994) and NFPA 24 (1991), Private Fire Service Mains. Flushing shall be continued at least until a clear flow is obtained.

TESTING:

All components of the system, from the tapping valve to branch lines, must be hydrostatically tested at 200 PSI for a minimum of two (2) hours. All piping must be exposed for the hydrostatic test. Portions of the systems may be tested separately but care must be taken to insure that all piping, connections thereto and all devices are tested. Flushing and hydrostatic tests must be witnessed by the Fire Marshal's Office or their designated representatives. Seventy-two hour notice must be given to the Fire Marshal and the Architect / Engineer prior to inspections, flushing or hydrostatic testing.

CERTIFICATION:

The Contractor shall certify that the work is installed in accordance with the project requirements and the requirements of NFPA 13 (1994) and NFPA 24 (1991). Prior to scheduling formal tests with the Authorities Having Jurisdiction, Contractor shall prepare and sign appropriate Contractor's Material and Test Certificates for each part of the work, as found in NFPA 13.

DRAWINGS OF RECORD:

Updating Drawings: Provide and keep up-to-date, a complete record set of approved shop drawings, corrected daily to show every change from the approved shop drawings. Keep this set of prints on the job site and use only as a record set. Do not make changes in the approved layout without definite instructions from the Project Manager in each case.

The up-to-date drawing shall be reviewed each month by the Project Manager as a condition of payment.

FINAL RECORD SET:

Upon completion of the work, the record drawings shall be submitted for review by the Architect / Engineer and Fire Marshal. After review, the record set shall be used to produce a set of vellum drawings of the complete installations. As-built drawings on mylar shall be furnished prior to acceptance of the installation.

END OF SECTION

SCOPE OF WORK:

The scope of work consists of the furnishing and installing of complete plumbing (exterior and interior) and HVAC systems including miscellaneous systems. The Mechanical Contractor (hereafter referred to as "the Contractor", either Plumbing or HVAC) shall provide all supervision, labor, materials, equipment, machinery, and any and all other items necessary to complete the systems. The Contractor shall note that all items of equipment are specified in the singular; however, the Contractor shall provide and install the number of items of equipment as indicated on the drawings and as required for complete systems.

It is the intention of the Specifications and Drawings to call for finished work, tested and ready for operation.

Any apparatus, appliance, material, or work not shown on the drawings but mentioned in the specifications, or vice versa, or any incidental accessories necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be furnished, delivered, and installed by the Contractor without additional expenses to the Owner. Minor details not usually shown or specified, but necessary for proper installation and operation, shall be included in the Contractor's estimate, the same as if herein specified or shown.

With submission of bid, the Contractor shall give written notice to the Architect of any materials or apparatus believed inadequate or unsuitable, in violation of laws, ordinances, rules, and any necessary items or work omitted. In the absence of such written notice, it is mutually agreed that the Contractor has included the cost of all required items in his proposal, and that he will be responsible for the approved satisfactory functioning of the entire system without extra compensation.

NOTICE TO BIDDERS, INSTRUCTIONS TO BIDDERS, SUPPLEMENTARY INSTRUCTIONS, GENERAL CONDITIONS, SUPPLEMENTARY GENERAL CONDITIONS, SPECIAL CONDITIONS, GENERAL REQUIREMENTS bound in the front of this document are included as a part of the specifications for this work.

MECHANICAL DRAWINGS AND SPECIFICATIONS:

The mechanical drawings are diagrammatic and indicate the general arrangement of fixtures, equipment, and work included in the contract. Consult the architectural, structural and electrical drawings and details for exact location and dimensions of fixtures and equipment; where same are not definitely located, obtain this information from the Architect.

The Contractor shall follow drawings in laying out work and check drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions at all points. Where headroom or space conditions appear inadequate, the Architect shall be notified before proceeding with installation. If directed by the Architect, the Contractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.

The plans and these specifications are intended to describe, imply and convey the materials and equipment as well as necessary labor, required for the installation as outlined in the paragraph entitled "Scope of Work". Any omissions from either the drawings or these specifications are unintentional, and it shall be the responsibility of the this Contractor to call to the attention of the Architect or Engineer any pertinent omissions before submission of a bid. The drawings which accompany these specifications are not intended to show in complete detail every fitting which may be required; however wherever reasonable implied by the nature of the work, any such material or equipment shall be installed by this Contractor as a part of his contract price. In no case will any extra charge be allowed unless authorized in writing by the Architect or Engineer.

The Contractor shall arrange with the General Contractor for required concrete and masonry chases, openings, and sub-bases so as not to delay progress of work. Work shall be installed sufficiently in advance of other construction to conceal piping and to permit work to be built in where required.

It shall be understood and agreed by all parties that where the words "Furnish", "Install", and / or "Provide" appear, the following definitions apply:

Furnish - to supply or give
Install - to place, establish or fix in position
Provide - to furnish and install as defined above

CODES, PERMITS, AND FEES:

The Contractor shall give all necessary notices, including electric and telephone utilities, obtain all permits, and pay all government taxes, fees, and other costs, including utility connections or extensions in connection with his work file all necessary plans, prepare all documents, and obtain all necessary approvals of all governmental departments having jurisdiction; obtain all required certificates of inspection for his work and deliver same to the Architect before request for acceptance and final payment for the work.

The Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus, drawings (in addition to contract drawing and documents) in order to comply with all applicable laws, ordinances, rules, and regulations, whether or not shown on drawings and / or specified.

Work and materials shall conform to the latest rules of the National Board of Fire Underwriter's Code and Regulations of the State Fire Marshall, and, or guarding of any moving parts, or otherwise hazardous conditions. Nothing in these specifications shall be construed to permit work not conforming to the most stringent of applicable codes.

The State Plumbing and Mechanical codes, and the mechanical requirements as established by the State and Local Fire Marshall, and rules and regulations of the local utilities serving the project are hereby made part of this specification. Should any changes be necessary in the drawings or specifications to make the work comply with these requirements, the Contractor shall notify the Architect.

VERIFICATION OF DIMENSIONS, DETAILS, EXISTING FIELD CONDITIONS:

The Contractor shall visit the premises prior to bidding, and thoroughly familiarize himself with all details of the work, working conditions, verify dimensions in the field, provide advice of any discrepancy, and submit shop drawings of any changes he proposes to make in quadruplicate for approval before starting any work.

The Contractor shall install all equipment in a manner to avoid building interference. No Change Order for extra work will be considered for items that were evident during a site visit.

The locations of existing underground utilities are shown in an approximate way only and have not been independently verified by the Owner or its representative. The Contractor shall determine the exact location of all existing utilities before commencing work, and agrees to be fully responsible for any and all damages which might be occasioned by the Contractor's failure to exactly locate and preserve any and all underground utilities.

ACCEPTABLE MANUFACTURERS:

Acceptable manufacturers, as specified in the Contract Documents, implies that the specified manufacturer may produce acceptable products equal in quality of materials and performance to such item specified. The Contractor will be required to provide products meeting, or exceeding the "Standard of Quality and Performance" as dictated by the product selection noted.

SHOP DRAWINGS AND EQUIPMENT SUBMITTALS:

The Contractor shall submit minimum of five (5) and maximum of seven (7) copies of the shop drawings to the Architect for approval within thirty (30) days after the award of the general contract. If such a schedule cannot be met, the Contractor may request in writing for an extension of time to the Architect. If the Contractor does not submit shop drawings in the prescribed time, the Architect has the right to select the equipment.

Shop drawings shall be submitted on all major pieces of mechanical equipment. Each item of equipment proposed shall be a standard catalog product of an established manufacturer. Certain major groups of equipment shall be provided from a singular manufacturer. The shop drawing shall give complete information on the proposed equipment. Each item of the shop drawings shall be properly labeled, indicating the intended service of the material, the job name, and the MC's name.

The shop drawings shall be neatly bound in five (5) sets and submitted to the Architect with a letter of transmittal. The letter of transmittal shall list each item submitted along with the manufacturer's name.

Approval rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are approved, said approval does not mean that drawings have been checked in detail; said approval does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the contract drawings and specifications.

AS-BUILT DRAWINGS:

The Contractor shall maintain accurate records of all deviations in work as actually installed from work indicated on the drawings. On completion of the project, two (2) complete sets of marked-up prints shall be delivered to the Architect.

MAINTENANCE AND OPERATING MANUALS:

Upon completion, the MC shall turn over to the Architect three (3) sets of complete maintenance manuals and parts list for all mechanical equipment used on the job. Manuals shall include equipment data, manufacturer's recommended maintenance, parts list, assembly drawings, warranties, and name, address, and phone numbers of suppliers of equipment. Indicate project name on cover and binder side.

COORDINATION WITH OTHER TRADES:

Coordinate all work required under this section with work of other sections of the specifications to avoid interference. Bidders are cautioned to check their equipment against space available as indicated on drawings, and shall make sure that proposed equipment can be accommodated. If interferences occur, Contractor shall bring them to attention in writing, prior to signing of contract; or, Contractor shall at his own expense provide proper materials, equipment, and labor to correct any damage due to defects in his work caused by such interference.

INSPECTION AND CERTIFICATES:

On the completion of the entire installation, the approval of the Architect and Owner shall be secured, covering the installation throughout. The Contractor shall obtain and pay for Certificate of Approval from the public authorities having jurisdiction. A final inspection certificate shall be submitted to the Architect prior to final payment. Any and all costs incurred for fees shall be paid by the Contractor.

EQUIVALENTS:

When material or equipment is mentioned by name, it shall form the basis of the Contract. When approved by the Architect in writing, other material and equipment may be used in place of those specified, but written application for such substitutions shall be made to the Architect as described in the Bidding Documents. The difference in cost of substitute material or equipment shall be given when making such request. Approval of substitute is, of course, contingent on same meeting specified requirements and being of such design and dimensions as to comply with space requirements.

WORKMANSHIP AND MATERIALS:

All workmanship shall be of the best quality, and all equipment and materials incorporated in the work under this Contract shall be new and equal to or better than the grade specified. Deviations in workmanship or materials will be corrected by the Contractor at his expense.

WARRANTY:

The Contractor shall submit upon completion of the work, a warranty by his acceptance of the contract, that all work installed will be free from defects in workmanship and materials. If, during the period of one year, or as otherwise specified from date of Certificate of Completion and acceptance of work, any such defects in workmanship, materials, or performance appear, the Contractor shall, without cost to the Owner, remedy such defects within reasonable time to be specified in notice from the Architect. In default, the Owner may have such work done and charge cost to Contractor.

CUTTING AND PATCHING:

The Mechanical Contractor (both Plumbing and HVAC) shall furnish sketches to the General Contractor showing the locations and sizes of all openings and chases, and furnish and locate all sleeves and inserts required for the installation of the mechanical work before the walls, floors, and roof are built. The Mechanical Contractor shall reimburse the General Contractor for the cost of cutting and patching, and shall be responsible for the cost of cutting and / or patching where any mechanical items were not installed or where incorrectly sized or located. The Contractor shall do all drilling required for the installation of his hangers. See also Section 01050, Cutting and Patching.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Basic methods and requirements for Division 15, MECHANICAL, applies to all sections of Division 15.
- B. Definitions:
 - 1. Exposed: Piping, ductwork, and equipment exposed to view in finished rooms.
 - 2. Option or optional: Contractor's choice of an alternate material or method.

1.2 RELATED WORK

- A. Excavation and Backfill: Section 02200, EARTHWORK.
- B. Concrete and Grout: Section 03300, CAST-IN-PLACE CONCRETE.
- C. Section 05500, METAL FABRICATIONS.
- D. Section 07600, FLASHING AND SHEET METAL, Flashing for Wall and Roof Penetrations
- E. Section 07920, SEALANTS AND CAULKING.
- F. Section 09900, PAINTING.
- G. Section 15170, MOTORS.
- H. Section 15250, INSULATION.
- J. Section 15805, TERMINAL UNITS.
- K. Section 15980, TESTING, ADJUSTING, AND BALANCING.
- L. Section 16400, SERVICE AND DISTRIBUTION.

1.3 QUALITY ASSURANCE

- A. Section 15980, TESTING, ADJUSTING, AND BALANCING.
- B. Equipment Vibration Tolerance:
 - 1. The allowable vibration tolerance shall be in accordance with 1999 ASHRAE Applications Handbook, Table 1, 46.3. Equipment specifications require factory balancing of equipment to this tolerance.
 - 2. After air balance work is completed and permanent drive sheaves are in place, perform field mechanical balancing and adjustments required to meet the specified vibration tolerance.
- C. Products Criteria:
 - 1. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 3 years. See other specification sections for any exceptions.
 - 2. Equipment Service: Products shall be supported by a service organization which maintains a complete inventory of repair parts and is located reasonably close to the site.
 - 3. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.
 - 4. Assembled Units: Manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.
 - 5. Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.
 - 6. Asbestos products or equipment or materials containing asbestos shall not be used.

- D. Welding: Before any welding is performed, contractor shall submit a certificate certifying that welders comply with the following requirements:
 - 1. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code", section IX, "Welding and Brazing Qualifications".
 - 2. Comply with provisions of ASME B31 series "Code for Pressure Piping".
 - 3. Certify that each welder has passed American Welding Society (AWS) qualification tests for the welding processes involved, and that certification is current.
- E. Manufacturer's Recommendations: Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Resident Engineer prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.
- F. Warranty: Section 01001, GENERAL CONDITIONS.
- I. Supports for sprinkler piping shall be in conformance with NFPA 13.
- J. Supports for standpipe shall be in conformance with NFPA 14.

1.4 SUBMITTALS

- A. Submit in accordance with General Provisions.
- B. Manufacturer's Literature and Data: Submit under the pertinent section rather than under this section.
 - 1. Submit belt drive with the driven equipment.
 - 2. Submit electric motor data and variable speed drive data with the driven equipment.
 - 3. Equipment and materials identification.
 - 4. Fire-stopping materials.
 - 5. Hangers, inserts, supports and bracing. Provide load calculations for variable spring and constant support hangers.
 - 6. Wall, floor, and ceiling plates.
- C. Coordination Drawings; provide where required in accordance with Section 01001, GENERAL CONDITIONS, Article, SUBCONTRACTS AND WORK COORDINATION. Provide:
 - 1. Mechanical equipment rooms.
 - 2. Interstitial space.
 - 3. Hangers, inserts, supports, and bracing.
 - 4. Pipe sleeves.
 - 5. Duct or equipment penetrations of floors, walls, ceilings, or roofs.
- D. Maintenance Data and Operating Instructions:
 - 1. Maintenance and operating manuals in accordance with Section 01010, GENERAL REQUIREMENTS, Article, INSTRUCTIONS, for systems and equipment.
 - 2. Provide a listing of recommended replacement parts for keeping in stock supply, including sources of supply, for equipment. Include in the listing belts for equipment: Belt manufacturer, model number, size and style, and distinguished whether of multiple belt sets.
- E. Provide copies of approved HVAC equipment submittals to the Testing, Adjusting and Balancing Subcontractor.

1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

- B. Federal Specifications (Fed. Spec.):
 - FF-S-325 Shield, Expansion; Nail, Expansion; and Nail, Drive Screw
(Devices, Anchoring, Masonry)
- C. Air Conditioning and Refrigeration Institute (ARI):
 - 430-89 Central Station Air-Handling Units
- D. American National Standard Institute (ANSI):
 - B31.1-98 Power Piping
- E. Rubber Manufacturers Association (ANSI/RMA):
 - IP-20-88 Drives Using Classical V-Belts and Sheaves - Cross Sections A,
B, C, D, and E
 - IP-21-91 Drives Using Double-V (Hexagonal) Belts (AA, BB, XX, DD Cross
Sections)
 - IP-22-91 Drives Using Narrow Multiple V-Belts (3V, 5V, and 8V Cross
Sections)
- F. Air Movement and Control Association (AMCA):
 - 410-96 Recommended Safety Practices for Air Moving Devices
- G. American Society of Mechanical Engineers (ASME):
 - Boiler and Pressure Vessel Code (BPVC):
 - SEC IX-98 Qualifications Standard for Welding and Brazing Procedures,
Welders, Brazers, and Welding and Brazing Operators
- H. American Society for Testing and Materials (ASTM):
 - A36/A36M-97 Carbon Structural Steel
 - A575-96 Steel Bars, Carbon, Merchant Quality, M-Grades
 - E84-98 Surface Burning Characteristics of Building Materials
 - E119-98 Fire Tests of Building Construction and Materials
- I. Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry, Inc:
 - SP-58-93 Pipe Hangers and Supports-Materials, Design and Manufacture
 - SP-69-96 Pipe Hangers and Supports-Selection and Application
- J. National Association of Plumbing - Heating - Cooling Contractors (NAPHCC):
 - 1996 National Standard Plumbing Code
- K. National Fire Protection Association (NFPA):
 - 90A-96 Installation of Air Conditioning and Ventilating Systems
 - 101-97 Life Safety Code

PART 2 - PRODUCTS

2.1 BELT DRIVES

- A. Type: ANSI/RMA standard V-belts with proper motor pulley and driven sheave. Belts shall be constructed of reinforced cord and rubber.
- B. Dimensions, rating and selection standards: ANSI/RMA IP-20 and IP-21.
- C. Minimum Horsepower Rating: Motor horsepower plus recommended ANSI/RMA service factor (not less than 20 percent) in addition to the ANSI/RMA allowances for pitch diameter, center distance, and arc of contact.
- D. Maximum Speed: 5000 feet per minute.
- E. Adjustment Provisions: For alignment and ANSI/RMA standard allowances for installation and take-up.
- F. Drives may utilize a single V-Belt (any cross section) when it is the manufacturer's standard.
- G. Multiple Belts: Matched to ANSI/RMA specified limits by measurement on a belt measuring fixture. Seal matched sets together to prevent mixing or partial loss of sets. Replacement, when necessary, shall be an entire set of new matched belts.
- H. Sheaves and Pulleys:

1. Material: Pressed steel, or close grained cast iron.
 2. Bore: Fixed or bushing type for securing to shaft with keys.
 3. Balanced: Statically and dynamically.
 4. Groove spacing for driving and driven pulleys shall be the same.
- I. Drive Types, Based on ARI 435:
1. Provide adjustable-pitch or fixed-pitch drive as follows:
 - a. Fan speeds up to 1800 RPM: 7.5 horsepower (10 kW) and smaller.
 - b. Fan speeds over 1800 RPM: 2.2 horsepower (3 kW) and smaller.
 2. Provide fixed-pitch drives for drives larger than those listed above.
 3. The final fan speeds required to just meet the system CFM and pressure requirements, without throttling, shall be determined by adjustment of a temporary adjustable-pitch motor sheave or by fan law calculation if a fixed-pitch drive is used initially.

2.2 DRIVE GUARDS

- A. For machinery and equipment, provide guards as shown in AMCA 410 for belts, chains, couplings, pulleys, sheaves, shafts, gears and other moving parts regardless of height above the floor. Drive guards may be excluded where motors and drives are inside factory fabricated air handling unit casings.
- B. Materials: Sheet steel, cast iron, expanded metal or wire mesh rigidly secured so as to be removable without disassembling pipe, duct, or electrical connections to equipment.
- C. Access for Speed Measurement: 1" diameter hole at each shaft center.

2.3 ELECTRIC MOTORS

- A. Section 15170, MOTORS, specifies the applicable requirements for electric motors. Provide special energy efficient motors as scheduled. Unless otherwise specified for a particular application use electric motors with the following requirements.
- B. Single-phase Motors: Capacitor-start type for hard starting applications. Motors for centrifugal fans and pumps may be split phase or permanent split capacitor (PSC).
- C. Poly-phase Motors: NEMA Design B, Squirrel cage, induction type. Each two-speed motor shall have two separate windings. Provide a time-delay (20 seconds minimum) relay for switching from high to low speed.
- E. Rating: Continuous duty at 100 percent capacity in an ambient temperature of 104 degrees F; minimum horsepower as shown on drawings; maximum horsepower in normal operation not to exceed nameplate rating without service factor.
- F. Insulation Resistance: Not less than one-half meg-ohm between stator conductors and frame, to be determined at the time of final inspection.

2.4 VARIABLE SPEED MOTOR CONTROLLERS

- A. Refer to Section 15965.
- B. The combination of controller and motor shall be provided by the respective air handler, fan or pump manufacturer, and shall be rated for 100 percent output performance. Multiple units of the same class of equipment, i.e. air handlers, fans, pumps, shall be product of a single manufacturer.
- C. Motors shall be energy efficient type and be approved by the motor controller manufacturer. The controller-motor combination shall be guaranteed to provide full motor nameplate horsepower in variable frequency operation. Both driving and driven motor/fan sheaves shall be fixed pitch.

- D. Controller shall not add any current or voltage transients to the input AC power distribution system, DDC controls, sensitive medical equipment, etc., nor shall be affected from other devices on the AC power system.

2.5 EQUIPMENT AND MATERIALS IDENTIFICATION

- A. Use symbols, nomenclature and equipment numbers specified, shown on the drawings and shown in the maintenance manuals.
- B. Interior (Indoor) Equipment: Engraved nameplates, with letters not less than 3/16" high of brass with black-filled letters, or rigid black plastic with white letters permanently fastened to the equipment. Identify unit components such as coils, filters, fans, etc.
- C. Exterior (Outdoor) Equipment: Brass nameplates, with engraved black filled letters, not less than 3/16" high riveted or bolted to the equipment.
- D. Control Items: Label all temperature and humidity sensors, controllers and control dampers. Identify and label each item as they appear on the control diagrams.
- E. Valve Tags and Lists:
 - 1. Plumbing: Provide for all valves (Fixture stops not included).
 - 2. HVAC: Provide for all valves other than for equipment in Section 15740, TERMINAL UNITS.
 - 3. Valve tags: Engraved black filled numbers and letters not less than 13 mm (1/2-inch) high for number designation, and not less than 6.4 mm(1/4-inch) for service designation on 19 gage 38 mm (1-1/2 inches) round brass disc, attached with brass "S" hook or brass chain.
 - 4. Valve lists: Typed or printed plastic coated card(s), sized 216 mm(8-1/2 inches) by 280 mm (11 inches) showing tag number, valve function and area of control, for each service or system. Punch sheets for a 3-ring notebook.
 - 5. Provide detailed plan for each floor of the building indicating the location and valve number for each valve. Identify location of each valve with a color coded thumb tack in ceiling.

2.6 FIRESTOPPING

See Sheet FP – 001. FIRESTOPPING specifies an effective barrier against the spread of fire, smoke and gases where penetrations occur for piping and ductwork. Refer also to Section 15250, INSULATION, for firestop pipe and duct insulation.

2.7 GALVANIZED REPAIR COMPOUND

Mil. Spec. DOD-P-21035B, paint form.

2.8 PIPE AND EQUIPMENT SUPPORTS AND RESTRAINTS

- A. Vibration Isolators: see drawing details.
- B. Supports For Roof Mounted Items:
 - 1. Equipment: Equipment rails shall be galvanized steel, 8 gauge, with integral baseplate, continuous welded corner seams, factory installed 2 by 4 treated wood nailer, 18 gauge galvanized steel counter flashing cap with screws, built-in cant strip, (except for gypsum or tectum deck), minimum height 11 inches. For surface insulated roof deck, provide raised cant strip to start at the upper surface of the insulation.
 - 2. Pipe/duct pedestals: Provide a galvanized unistrut channel welded to U-shaped mounting brackets which are secured to side of rail with galvanized lag bolts.
- D. For Attachment to Concrete Construction:
 - 1. Concrete insert: Type 18, MSS SP-58.
 - 2. Self-drilling expansion shields and machine bolt expansion anchors: Fed. Spec. FF-S-325, permitted in concrete not less than four inches thick. Applied load shall not exceed one-fourth the proof test load listed in Fed. Spec. FF-S-325.

3. Power-driven fasteners: Permitted in existing concrete or masonry not less than four inches thick when approved by the Resident Engineer for each job condition. Applied load shall not exceed one-fourth the proof test load listed in Fed. Spec. FF-S-325.
- F. For Attachment to Steel Construction: MSS SP-58.
1. Welded attachment: Type 22.
 2. Beam clamps: Types 20, 21, 28 or 29. Type 23 C-clamp may be used for individual copper tubing up to 7/8-inch outside diameter.
- G. Attachment to Metal Pan or Deck: As required for materials specified in Division 5.
- H. For Attachment to Wood Construction: Wood screws or lag bolts.
- I. Hanger Rods: See Section 15060.
- J. Multiple (Trapeze) Hangers: Galvanized, cold formed, lipped steel channel horizontal member, not less than 1-5/8 inches by 1-5/8 inches, No. 12 gauge, designed to accept special spring held, hardened steel nuts. Not permitted for steam supply and condensate piping.
1. Allowable hanger load: Manufacturers rating less 91kg (200 pounds).
 2. Guide individual pipes on the horizontal member of every other trapeze hanger with 6 mm (1/4-inch) U-bolt fabricated from steel rod. Provide Type 40 insulation shield, secured by two 13mm (1/2-inch) galvanized steel bands, or preinsulated calcium silicate shield for insulated piping at each hanger.
- K. Pipe Hangers and Supports:
1. Converter and Expansion Tank Hangers: May be Type 1 sized for the shell diameter. Insulation where required will cover the hangers.
 2. Plumbing Piping (Other Than General Types):
 - a. Horizontal piping: Type 1, 5, 7, 9, and 10.
 - b. Chrome plated piping: Chrome plated supports.
 - c. Hangers and supports in pipe chase: Prefabricated system ABS self-extinguishing material, not subject to electrolytic action, to hold piping, prevent vibration and compensate for all static and operational conditions.
 - d. Blocking, stays and bracing: Angle iron or preformed metal channel shapes, 1.3 mm (18 gage) minimum.
- L. Pre-insulated Calcium Silicate Shields:
1. Provide 360 degree water resistant high density 965 kPa (140 psi) compressive strength calcium silicate shields encased in galvanized metal.
 2. Pre-insulated calcium silicate shields to be installed at the point of support during erection.
 3. Shield thickness shall match the pipe insulation.
 4. The type of shield is selected by the temperature of the pipe, the load it must carry, and the type of support it will be used with.
 - a. Shields for supporting chilled or cold water shall have insulation that extends a minimum of 1 inch past the sheet metal. Provide for an adequate vapor barrier in chilled lines.
 - b. The pre-insulated calcium silicate shield shall support the maximum allowable water filled span as indicated in MSS-SP 69. To support the load, the shields may have one or more of the following features: structural inserts 4138 kPa (600 psi) compressive strength, an extra bottom metal shield, or formed structural steel (ASTM A36) wear plates welded to the bottom sheet metal jacket.
 5. Shields may be used on steel clevis hanger type supports, roller supports or flat surfaces.
- M. Seismic Restraint of Piping:
1. Design criteria is as follows:
 - a. Piping resiliently supported: 120 percent of the weight of the systems and components and contents.

- b. Piping not resiliently supported: 60 percent of the weight of the system components and contents.
 - c. Except as noted above, meet the more severe requirements of the Local Code and the latest Uniform Building Code for determining seismic force F_p .
2. Provide one of the following options:
- a. Design and installation to meet the criteria listed above, and meet requirements of the latest Sheet Metal and Air Conditioning Contractors National Association (SMACNA), Seismic Restraint Manual Guidelines for Mechanical Systems for the prescribed Seismic Hazard Level
 - b. Design and installation to meet the criteria listed above, and meet the most current requirements of the National Uniform Seismic Installation Guidelines (NUSIG). Contractor shall submit all design tables and information for the design force levels, stamped and signed by a professional engineer registered in the State where project is located.
 - c. Where SMACNA or NUSIG requirements are not met completely, submit proposed alternate details and calculations to completely address seismic bracing requirements. Such designs shall use more severe of the Local Code and the Uniform Building Code requirements for determining seismic forces, and be performed, stamped and signed by a professional engineer registered in the State where project is located. Revise if necessary any details shown on the contract drawings for vertical support and lateral bracing, and submit for the approval of the Owner to meet the design criteria listed above.

2.9 PIPE PENETRATIONS

- A. Install sleeves during construction for other than blocked out floor openings for risers in chases.
- B. To prevent accidental liquid spills from passing to a lower level, provide the following:
 1. For sleeves: Extend sleeve 25 mm (one inch) above finished floor and provide sealant for watertight joint.
 2. For blocked out floor openings: Provide 40 mm (1-1/2 inch) angle set in silicone adhesive around opening.
 3. For drilled penetrations: Provide 40 mm (1-1/2 inch) angle ring or square set in silicone adhesive around penetration.
- C. Penetrations are not allowed through beams or ribs, but may be installed in concrete beam flanges. Any deviation from this requirements must receive prior approval of Resident Engineer.
- D. Sheet Metal, Plastic, or Moisture-resistant Fiber Sleeves: Provide for pipe passing through floors, interior walls, and partitions, unless brass or steel pipe sleeves are specifically called for below.
- E. Cast Iron or Zinc Coated Pipe Sleeves: Provide for pipe passing through exterior walls below grade. Make space between sleeve and pipe watertight with a modular or link rubber seal. Seal shall be applied at both ends of sleeve.
- F. Galvanized Steel or an alternate Black Iron Pipe with asphalt coating Sleeves: Provide for pipe passing through concrete beam flanges, except where brass pipe sleeves are called for. Provide sleeve for pipe passing through floor of mechanical rooms and similar. Except in mechanical rooms, connect sleeve with floor plate.
- G. Brass Pipe Sleeves: Provide for pipe passing through quarry tile, terrazzo or ceramic tile floors. Connect sleeve with floor plate.
- H. Sleeves are not required for wall hydrants for fire department connections or in drywall construction.
- I. Sleeve Clearance: Sleeve through floors, walls, partitions, and beam flanges shall be one inch greater in diameter than external diameter of pipe. Sleeve for pipe with insulation shall be large enough to accommodate the insulation. Interior openings shall be caulked tight with fire stopping material and sealant to prevent the spread of fire, smoke, and gases.
- J. Sealant and Adhesives: Shall be as specified in Section 07920, SEALANTS AND CAULKING.

2.10 TOOLS AND LUBRICANTS

- A. Furnish, and turn over to the Owner special tools not readily available commercially, that are required for disassembly or adjustment of equipment and machinery furnished.
- B. Grease Guns with Attachments for Applicable Fittings: One for each type of grease required for each motor or other equipment.

- C. Tool Containers: Hardwood or metal, permanently identified for in tended service and mounted, or located, where directed by the Owner.
- D. Lubricants: A minimum of 0.95 L (one quart) of oil, and 0.45 kg (one pound) of grease, of equipment manufacturer's recommended grade and type, in unopened containers and properly identified as to use for each different application.

2.11 WALL, FLOOR AND CEILING PLATES

- A. Material and Type: Chrome plated brass or chrome plated steel, one piece or split type with concealed hinge, with set screw for fastening to pipe, or sleeve. Use plates that fit tight around pipes, cover openings around pipes and cover the entire pipe sleeve projection.
- B. Thickness: Not less than 2.4 mm (3/32-inch) for floor plates. For wall and ceiling plates, not less than 0.64 mm (0.025-inch) for up to 80 mm (3-inch pipe), 0.89 mm (0.035-inch) for larger pipe.
- C. Locations: Use where pipe penetrates floors, walls and ceilings in exposed locations, in finished areas only. Use also where insulation ends on exposed water supply pipe drop from overhead. Provide a watertight joint in spaces where brass or steel pipe sleeves are specified.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Coordinate location of piping, sleeves, inserts, hangers, ductwork and equipment. Locate piping, sleeves, inserts, hangers, ductwork and equipment clear of windows, doors, openings, light outlets, and other services and utilities. Follow manufacturer's published recommendations for installation methods not otherwise specified.
- B. Protection and Cleaning:
 - 1. Equipment and materials shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation, in accordance with the manufacturer's recommendations and as approved by the Owner. Damaged or defective items in the opinion of the Owner, shall be replaced.
 - 2. Protect all finished parts of equipment, such as shafts and bearings where accessible, from rust prior to operation by means of protective grease coating and wrapping. Close pipe openings with caps or plugs during installation. Tightly cover and protect fixtures and equipment against dirt, water chemical, or mechanical injury. At completion of all work thoroughly clean fixtures, exposed materials and equipment.
- C. Concrete and Grout: Use concrete and shrink compensating grout 25 MPa (3000 psi) minimum, specified in Section 03300, CAST-IN-PLACE CONCRETE.
- D. Install gages, thermometers, valves and other devices with due regard for ease in reading or operating and maintaining said devices. Locate and position thermometers and gages to be easily read by operator or staff standing on floor or walkway provided. Servicing shall not require dismantling adjacent equipment or pipe work.
- E. Install steam piping expansion joints as per manufacturer's recommendations.
- F. Work in Existing Building:
 - 1. Perform as specified in Article, OPERATIONS AND STORAGE AREAS, Article, ALTERATIONS, and Article, RESTORATION of the Section 01010, GENERAL REQUIREMENTS for relocation of existing equipment, alterations and restoration of existing building(s).
 - 2. As specified in Section 01010, GENERAL REQUIREMENTS, Article, OPERATIONS AND STORAGE AREAS, make alterations to existing service piping at times that will least interfere with normal operation of the facility.
 - 3. Cut required openings through existing masonry and reinforced concrete using diamond core drills. Use of pneumatic hammer type drills, impact type electric drills, and hand or manual hammer type drills, will be permitted only with approval of the Owner. Locate openings that will least effect structural slabs, columns, ribs or beams. Refer to the Owner for determination of proper design for openings through structural sections and opening layouts approval, prior to cutting or drilling into structure. After Owner's approval, carefully cut opening through construction no larger than absolutely necessary for the required installation.
- G. Exterior: Seal all pipe and duct penetrations with silicone sealant to prevent entrance of insects.

- H. Switchgear Drip Protection: Every effort shall be made to eliminate the installation of pipe above electrical and telephone switchgear. If this is not possible, encase pipe in a second pipe with a minimum of joints.
- I. Inaccessible Equipment:
 - 1. Where the Engineer / Owner determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled or remedial action performed as directed at no additional cost to the Owner.
 - 2. The term "conveniently accessible" is defined as capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as motors, fans, pumps, belt guards, transformers, high voltage lines, piping, and ductwork.

3.2 PIPE AND EQUIPMENT SUPPORTS

- A. Where hanger spacing does not correspond with joist or rib spacing, use structural steel channels secured directly to joist and rib structure that will correspond to the required hanger spacing, and then suspend the equipment and piping from the channels. Drill or burn holes in structural steel only with the prior approval of the Owner.
- B. Use of chain, wire or strap hangers; wood for blocking, stays and bracing; or, hangers suspended from piping above will not be permitted. Replace or thoroughly clean rusty products and paint with zinc primer.
- C. Use hanger rods that are straight and vertical. Turnbuckles for vertical adjustments may be omitted where limited space prevents use. Provide a minimum of 15 mm (1/2-inch) clearance between pipe or piping covering and adjacent work.
- D. HVAC Horizontal Pipe Support Spacing: Refer to MSS SP-69. Provide additional supports at valves, strainers, in-line pumps and other heavy components. Provide a support within one foot of each elbow.
- E. HVAC Vertical Pipe Supports:
 - 1. Up to 150 mm (6-inch pipe), 9 m (30 feet) long, bolt riser clamps to the pipe below couplings, or welded to the pipe and rests supports securely on the building structure.
 - 2. Vertical pipe larger than the foregoing, support on base elbows or tees, or substantial pipe legs extending to the building structure.
- F. Plumbing horizontal and vertical pipe supports, refer to the State Plumbing Code.

3.3 MOTOR AND DRIVE ALIGNMENT

- A. Belt Drive: Set driving and driven shafts parallel and align so that the corresponding grooves are in the same plane.
- B. Direct-connect Drive: Securely mount motor in accurate alignment so that shafts are free from both angular and parallel misalignment when both motor and driven machine are operating at normal temperatures.

3.4 LUBRICATION

Field check and lubricate equipment requiring lubrication prior to initial operation.

3.5 STARTUP AND TEMPORARY OPERATION

Start up equipment as described in equipment specifications. Verify that vibration is within specified tolerance prior to extended operation. Temporary use of equipment is specified in Section 01010, GENERAL REQUIREMENTS, Article, TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT.

3.6 OPERATING AND PERFORMANCE TESTS

- A. Prior to the final inspection, perform required tests as specified in Section 01010, GENERAL REQUIREMENTS, Article, TESTS and submit the test reports and records to the Owner.

- B. Should evidence of malfunction in any tested system, or piece of equipment or component part thereof, occur during or as a result of tests, make proper corrections, repairs or replacements, and repeat tests at no additional cost to the Owner.
- C. When completion of certain work or system occurs at a time when final control settings and adjustments cannot be properly made to make performance tests, then make performance tests for heating systems and for cooling systems respectively during first actual seasonal use of respective systems following completion of work.

END OF SECTION

PART I: GENERAL

- A. Design channel support systems for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
- B. Submittals: Provide Product Data for each type of pipe hanger, channel support system component, and thermal-hanger shield insert indicated.

PART II: PRODUCTS

- A. Pipe Hangers, Supports, and Components: MSS SP-58, factory fabricated components.
 - 1. Galvanized, Metallic Coatings: For piping and equipment that will not have field-applied finish.
 - 2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- B. Channel Support Systems: MFMA-2, factory-fabricated components for field assembly.
 - 1. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.
 - 2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- C. Thermal-Hanger Shield Inserts: 100-psi (690-kPa) minimum compressive strength insulation, encased in sheet metal shield.
 - 1. Material for Cold Piping: ASTM C 552, Type I cellular glass or water-repellant-treated, ASTM C 533, Type I calcium silicate with vapor barrier.
 - 2. Material for Hot Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate.
 - 3. For Clevis or Band Hanger Insert and shield cover lower 180 degrees of pipe.
 - 4. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.
- D. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
- E. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.
- F. Grout ASTM C 1107, Grade B, factory-mixed and -packaged, non-shrink and nonmetallic, dry, hydraulic-cement grout.
 - 1. Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.
 - 2. Properties: Non-staining, non-corrosive, and non-gaseous.

PART III: EXECUTION

- A. Specific hanger requirements are specified in Sections specifying equipment and systems.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Specification Sections.
- C. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated stationary pipes, NPS 1/2 to NPS 30 (DN15 to DN750).
 2. -Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24 (DN20 to DN600), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
 3. Adjustable Steel Band Hangers (MSS Type 7): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 8 (DN15 to DN200).
 4. U-Bolts (MSS Type 24): For support of heavy pipe, NPS 1/2 to NPS 30 (DN15 to DN750).
- D. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Steel Tumbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
- E. Building Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
 2. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 3. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 4. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 5. C-Clamps (MSS Type 23): For structural shapes.
 6. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb. (340 kg).
 - b. Medium (MSS Type 32): 1500 lb. (675 kg).
 - c. Heavy (MSS Type 33): 3000 lb. (1 350 kg).
 7. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 8. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
- F. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended by manufacturer to prevent crushing insulation.
- G. Pipe Hanger and Support Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- H. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
1. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," is not exceeded.

- L. Insulated Piping: Comply with the following:
1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits according to ASME B31.9.
 2. Install MSS SP-58, Type 39 protection saddles, if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 3. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span arc of 180 degrees.
 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2 (DN8 to DN90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
 5. Insert Material: Length at least as long as protective shield.
 6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.
- M. Equipment Supports: Fabricate structural-steel stands to suspend equipment from structure above or to support equipment above floor. Place grout under supports for equipment and make smooth bearing surface.
- N. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations. Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.
- O. Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- P. Touching Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).
- Q. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.
- R. Install all hangers and supports prior to application of fire-proofing by GC. Any fire-proofing damaged by this Contractor shall be repaired by this Contractor.

END OF SECTION

EXCAVATING AND BACKFILLING FOR MECHANICAL WORK:

Refer to specification sections 02210 - *Trenching and Backfilling for Utilities* and 02220 - *Earthwork*

In general, DO NOT excavate for mechanical work until work is ready to proceed without delay to maintain minimum time lapse from excavation to completion of backfilling. Excavate with vertical sided excavations to greatest extent possible providing sheeting and cross-bracing to sustain sides where necessary. All shoring and sheeting required to protect the excavation shall be constructed and maintained in strict accordance with all applicable State and Federal Regulations.

Excavate trench for piping to uniform width with 18" minimum clearance both sides of piping providing adequate working room. Correct over-excavation by means of backfilling with concrete, or tamped and compacted backfill material approved for other backfilling work. All excavated materials not suitable or required for backfill shall be removed as directed or required in a lawful manner.

Whenever wet or otherwise unstable soil that is incapable of adequately supporting pipe is encountered in trench bottoms, remove such material to depth required and replace to the proper grade with selected material compacted as hereinafter specified for backfilling of pipe. Provide unit prices on Form of Proposal.

Support pipe directly on undisturbed soil. Do not excavate beyond required or indicated depth, and hand-excavate bottom cut to accurate elevations. Do not backfill until installed mechanical work has been tested and accepted. Provide 6" wide utility warning tape with magnetic detection 6 to 8" below finish grade during backfill operation over all piping exterior to building.

Conditions backfill material by either drying or adding water uniformly, necessary to facilitate compaction to required densities. Do not backfill with frozen soil materials. Backfill simultaneously on opposite sides of mechanical work and compact simultaneously without dislocating work from installed positions. Continue backfilling in 8" layers, uniformly compacted to 85% density for cohesive soils, 90% for cohesionless soils (90% for cohesive, 95% for cohesionless soils under paved surfaces) using power-driven hand-operated compaction equipment. Correct improperly backfill that has settled.

All paving and concrete removed or cut, shall be replaced or patched to satisfaction of Architect.

All landscaping (trees, shrubbery, grass, etc.) removed or damaged, shall be replaced to satisfaction of Architect.

Existing utility lines (gas, electric, communications, sewer, water, etc.) shall be protected from damage during excavation and backfilling, and, if damaged, shall be repaired by the Contractor at his expense. In the event that the Contractor damages any existing utility lines, he shall report thereof immediately. If it is determined that repairs shall be made by the Contractor, such repairs shall be ordered under terms of other sections of these specifications.

END OF SECTION

PART I - GENERAL

SCOPE:

This Section includes basic requirements for motors. It includes motors that are factory-installed as part of equipment and appliances as well as field-installed motors.

QUALITY ASSURANCE:

1. Comply with NFPA 70, "National Electrical Code.
2. Comply with NEMA MG-1, "Motors and Generators".
3. Comply with UL 1004, "Motors, Electric".
4. Comply with NCSBC, Volume X, Chapter 4, Section 401.2, "Electric Motors".

PART II - PRODUCTS

A. MOTORS, GENERAL

1. General: Requirements below apply to motors covered by this Section except as otherwise indicated.
2. Motors 1 hp and larger: Polyphase.
3. Motors Smaller Than $\frac{3}{4}$ " hp and less: Single-phase.
4. Frequency Rating: 60 Hz.
5. Voltage Rating: Determined by voltage of circuit to which motor is connected for the following motor voltage ratings (utilization voltages):
 - a. 120V Circuit: 115V - motor rating.
 - b. 208V Circuit: 200V - motor rating.
 - c. 480V Circuit: 460V - motor rating.
6. Service factors indicated for motors are minimum values and apply at frequency and utilization voltage at which motor is connected. Provide motors which will not operate in service factor range when supply voltage is within 10 percent of motor voltage rating.
7. Capacity: Sufficient to start and operate connected loads at designated speeds in indicated environment, and with indicated operating sequence, without exceeding nameplate ratings. Provide motors rated for continuous duty at 100 percent of rated capacity.
8. Temperature Rise: Based on 40 deg C ambient except as otherwise indicated.
9. Enclosure: Open dripproof.
10. Minimum full-load efficiency per tables 401.2.1 a & b of NCSBC Volume X Energy Code.

B. POLYPHASE MOTORS

1. General: Squirrel-cage induction-type conforming to the following requirements except as otherwise indicated.
2. NEMA Design Letter Designation: "b".
3. Internal Thermal Overload protection For Motors: For motors so indicated, protection automatically opens control circuit arranged for external connection. Protection operates when winding temperature exceeds safe value calibrated to the temperature rating of the motor insulation.

4. Bearings: Double-shielded, prelubricated ball bearings suitable for radial and thrust loading of the application.
5. Rugged Duty Motors: Totally enclosed with 1.25 minimum service factor. Provide motors with regreasable bearings and equipped with capped relief vents. Insulate windings with nonhygroscopic material. External finish shall be chemical resistant paint over corrosion resistant primer. Provide integral condensate drains.

C. SINGLE-PHASE MOTORS

1. General: Conform to the following requirements except as otherwise indicated.
2. Energy Efficient Motors: One of the following types as selected to suit the starting torque and other requirements of the specific motor application.
 - a. Permanent Split Capacitor.
 - b. Split-Phase Start, Capacitor-Run.
 - c. Capacitor-Start, Capacitor-Run.
3. Shaded-Pole Motors: Use only for motors smaller than 1/20 hp.
4. Internal Thermal Overload Protection for Motors: For motors so indicated, protection automatically opens the power supply circuit to the motor, or a control circuit arranged for external connection. Protection operates when winding temperature exceeds a safe value calibrated to the temperature returns to normal range except as otherwise indicated.
5. Bearings, belt connected motors and other motors with high radial forces on motor shaft shall be ball bearing type. Sealed, prelubricated sleeve bearings may be used for other single phase motors.

PART III - EXECUTION

INSTALLATION:

Install motors in accordance with manufacturer's published instruction.

PART IV - COMMISSIONING

1. Check operating motors, both factory and field-installed, for unusual conditions during normal operation. Coordinate with the commissioning of the equipment for which the motor is a part.
2. Report unusual conditions.
3. Correct deficiencies of field-installed units.

END OF SECTION

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and General Provisions of Contract, including General and Supplementary conditions and Division-1 Specification Sections, apply to work of this section.

DESCRIPTION OF WORK:

This section contains the requirements relating to the materials and methods used to identify items described in Division 15.

PART 2 - PRODUCTS

ENGRAVED PLASTIC-LAMINATE SIGNS:

Provide engraving stock melamine plastic laminate, in the sizes and thickness indicated, engraved with engraver's standard letter style of the sizes and wording indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate. Plastic laminate thickness shall be 1/16" for units up to 20 square inches or 8" length; 1/8" for larger units. Provide self-tapping stainless steel screws.

PIPE IDENTIFICATION:

All plumbing/mechanical piping identification shall adhere to ANSI A13.1 – 1981. Interior piping, all locations, shall utilize Seton "Setmark" or equal pipe markers. Exterior piping in exposed locations such as manholes/tunnels, at pad mounted chiller, etc., shall utilize Seton "Ultra-mark" or equal pipe markers. All pipe markers shall be snap around whenever possible. Markers shall be located at each wall, floor or ceiling penetration, whether exterior or interior, and every 20 ft. thereafter. Markers shall be fully legible from floor level showing medium contained in pipe, and directional arrows.

Piping shall be identified as follows: DOMESTIC COLD WATER SUPPLY, DOMESTIC HOT WATER SUPPLY, HEATING WATER SUPPLY, HEATING WATER RETURN, DOMESTIC HOT WATER RETURN, CHILLED WATER SUPPLY, CHILLED WATER RETURN, HIGH PRESSURE STEAM, LOW PRESSURE STEAM, CONDENSATE RETURN, CONDENSATE PUMP DISCHARGE, ROOF DRAIN, FIRE PROTECTION WATER, MAKE UP WATER, WASTE, VENT & others by approval by submittals.

VALVE IDENTIFICATION:

Provide 19-gauge polished brass valve tags with stamp-engraved piping system abbreviation in 1/4" high letters and sequenced valve numbers 1/2" high and with 5/32" hole for fastener. Provide 1-1/2" diameter tags except as otherwise indicated.

PART 3 - EXECUTION

INSTALLATION REQUIREMENTS:

A. COORDINATION:

Coordinate new labeling with existing labeling through Project Manager. Where identification is to be applied to surfaces that require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, identification shall be installed after completion of covering and painting. Identification is to be installed prior to installation of acoustical ceilings and similar removable concealment.

B. DUCTWORK IDENTIFICATION:

1. General: Provide for identification of air supply, return, exhaust, intake, and relief ductwork with stenciled signs and arrows, showing ductwork service and direction of flow, in black and white.
2. Locations: Ductwork shall be identified every 20' in spaces with removable ceilings and at each access door in spaces with hard ceilings. Exposed ductwork shall be identified every 20' in mechanical rooms. As described above, ductwork shall be labeled on both sides of floor and wall penetrations.
3. Access Doors: Provide engraved plastic-laminate signs on each access door in ductwork and housings, indicating purpose of access (to what equipment) and other maintenance and operating instructions, and appropriate and procedural information.

C. PIPING SYSTEM IDENTIFICATION:

1. General: Provide for pipe markers as follows:

Wrap around plastic identification with application system as indicated under Part 2 – Products in this Section. Include arrows to show normal direction of flow. For hot non-insulated pipes, install a segment of pipe insulation with appropriate piping identification.
2. Locate identification as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces and exterior non-concealed locations.
 - a. Near each valve and control device.
 - b. Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow pattern.
 - c. At locations where pipes pass through walls, floors, ceilings, or enter non-accessible enclosures.
 - d. At access doors, manholes and similar access points which permit view of concealed piping.
 - e. At major equipment items and other points of origination and termination.
 - f. Spaced intermediately at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment.
 - g. On piping above removable acoustical ceilings, except omit intermediately spaced markers.
 - h. Identify non potable piping and outlets.
3. The following piping shall be color-coded (not banded or striped) in exposed locations by completely painting the piping with the indicated color. Use standard identification methods in concealed areas.
 - a. Fire protection piping - RED
 - b. Gas piping - YELLOW
 - c. All others – WHITE with appropriate identification

D. VALVE IDENTIFICATION:

Provide for valve tags on every valve cock and control device in each piping system; exclude check valves, valves within factory-fabricated equipment units, plumbing fixture faucets, convenience and lawn-watering hose bibs, and shut-off valves at plumbing fixtures. HVAC terminal devices and similar rough-in connections of end-use fixtures and units. List each tagged valve in a valve schedule for each piping system.

E. MECHANICAL EQUIPMENT IDENTIFICATION:

Provide for engraved plastic laminate sign on or near each major item of mechanical equipment and each operational device. Provide signs for the following general categories of equipment and operational devices:

1. Main control and operating valves, including safety devices.
2. Meters, gauges, thermometers and similar units.
3. Fuel-burning units including boilers, furnaces, and heaters.
4. Pumps, compressors, chillers, condensers and similar motor-driven units.
5. Heat exchangers, coils, evaporators, cooling towers, heat recovery units and similar equipment.
6. Fans, blowers, primary balancing dampers and VAV boxes.
7. HVAC central-station and zone-type units.
8. Tanks and pressure vessels.
9. Air conditioning indoor and outdoor units.
10. AFD's and transmitters and Control Boxes.

END OF SECTION

GENERAL:

Furnish and install a complete sanitary drain, waste and vent system as shown on the drawings and as specified herein.

No waste or vent piping buried below slab shall be smaller than 2". Make any change in flow direction or grade gradually with proper curved fittings. Make all junctions with wye branches or wye and eighth bend. Sanitary tees may be used for vertical junctions. Size pipe per drawings.

Keep piping clean during construction. Seal all clean-outs and fixture connections. Remove all earth or foreign matter. Bed, fill and compact all line trenches according to Section 15150 or as detailed on the plans to prevent strain on joints, damage or settling.

Set all water closet fittings, floor drains, clean-outs, etc., carefully, using a spirit level. Confirm final floor elevations. The Plumbing Contractor shall have a journeyman present at all times while General Contractor is pouring concrete to insure proper installation of work in this Contract.

Install all piping with 1/4" per foot slope wherever possible but with minimum slopes as follows: 3" and less - 1/4" per foot; 4" and larger - 1/8" per foot.

DRAIN, WASTE AND VENT PIPING BELOW SLAB:

Construct all building sewers and building drain lines below floor slabs and outside of building walls, unless indicated otherwise on the drawings, with Schedule 40 PVC-DWV Pipe, ASTM D-2665, marked to indicate that it complies with this standard. Pipe shall be manufactured by Charlotte Pipe and Foundry or equivalent. All installations shall conform to installation instructions of the Plastic Pipe Institute, manufacturer, and/ or local ordinances. In all cases, approved cleaner, primer and solvent cement designated for the specified material shall be used.

DRAIN, WASTE AND VENT PIPING ABOVE FLOOR SLAB:

All waste and vent piping above the floor slab shall be Schedule 40 PVC-DWV in accordance with Commercial Standards CS272-65, or CS270-65, or ASTM Standards D2665-68 or D2661-67. All plastic pipe and fittings shall bear the NSF Seal of Approval, and such other markings as required by the aforementioned standards. Fittings shall be molded, fully recessed, socket type designed for solvent welded joints. All plastic piping shall be installed and joined in strict accordance with the pipe manufacturer's instructions. Plastic waste and vent pipe shall not be used in any return air plenum unless it is fully encased in a fireproof covering or as required by any code.

TRAPS:

Provide each fixture with a trap when connection to drainage system is required. Place each trap as near to fixture as possible. No fixture shall be double trapped.

PIPE STORAGE:

If possible, pipe should be stored inside. Otherwise, store pipe on dry, level ground free from sharp objects. Protect stored pipe from ultraviolet exposure as required. Refer to manufacturer's recommendations for rack or pallet storage and freezing temperatures.

PIPE HANGERS AND SUPPORTS:

Support Schedule 40 PVC- DWV pipe with carbon steel adjustable clevis-type hangers, 5' o.c. with 3/8" threaded rod. Chain, strap, perforated bar, or wire hangers will not be permitted. Where required, provide

suitable concrete inserts in masonry or concrete during laying or placing of those materials. Acceptable manufacturers are B-line, PHD, Gulf State Hangers, and Grinnell.

PIPE SLEEVES:

Provide pipe sleeves where all pipe passes through floors, utility platforms, walls, roofs, etc. Size sleeves for insulated pipe to accommodate both pipe and insulation. Sleeves for piping masonry or concrete walls, floors, beams, or roof, shall be of black steel pipe of standard weight, unless otherwise specified or shown. Vertical sleeves through floors shall extend at least 1" above finished floor (4" through utility platforms).

ROOF VENT FLASHING:

Vents through roof shall be flashed with 4 lbs. lead or 16 oz. copper extending 12" each way from the vent. Provide lead collar, soldered to, and extending from flashing up, around, and turned down a minimum of 1" into top of vent.

CLEAN-OUTS:

Provide clean-outs at the base of all plumbing stacks, 2'-0" above finish floor if required by local codes; at all changes in direction of all sewers; and wherever indicated on the drawings.

All cleanouts shall be as manufactured by Smith, Josam, or equal by Zurn.

FLOOR, WALL, AND CEILING PLATES:

Where pipes pass through floors, finished walls or ceilings, fit with chromium plated cast brass plates or chromium steel plates as specified hereinafter. Plates shall be large enough to completely close hole around pipes, and shall be square, octagonal, or round, with least dimension not less than 1.5 times larger than diameter of pipe. Secure plates in an approved manner. Plates shall be Beaton-Caldwell No. 3A for floor and No. 40 for walls and ceilings.

PRESSURE TESTS:

The engineer shall be notified several days before testing is to be conducted and all tests shall be conducted in presence of engineer. Prior to notifying the engineer, the Contractor shall have successfully tested the piping. The Contractor shall bear the expense of the engineer's services if the tests prove unsuccessful after the engineer has been summoned by the Contractor to observe the test.

Water test all interior soil, waste, vent, and drain piping with 10' head pressure before connecting to exterior sewers and before connecting to fixtures. Water shall remain in each system for at least 4 hours. Leaks shall be repaired and tests repeated until system fulfills this test. Systems may be tested in sections, but each joint between sections shall be tested. Do not exceed 25' head pressure on any joint.

Water test all exterior sanitary sewers with 4'-0" minimum head (above the invert) at the highest point of the sewer. Infiltration or exfiltration shall not exceed 50 gallons per inch diameter per mile per 24 hours.

Contractor shall use video camera to detect installation deficiencies such as excessive deflections, damaged pipes, leaking joints, etc. Engineer's and / or Owner's representative shall be on site to witness videotaping of all sewer piping. Contractor shall provide two (2) video tapes with corresponding diagrams for Owner's record.

END OF SECTION

PART I: GENERAL

Furnish and install insulation for hydronic and air distribution systems where shown on plans, and specified below.

HW PIPE INSULATION:

Insulate hydronic system piping, fittings, flanges, unions, etc. Insulation shall be a jacketed glass fiber pipe covering, 1" thick for pipe sizes 1" & less, 1.5" thick for pipes sizes 1.25" through 3", 2" thick for pipes 4" & above with flame resistant vapor barrier jacket meeting ASTM E84 and UL 723.

Insulation shall be Knauf 850 or equal by Owens-Corning or Schuller. Provide pre-formed PVC jacket covers over insulated fittings such as els, tees, valves, etc. and over all piping in boiler room (see below).

CHILLED WATER PIPE INSULATION:

Insulate chilled water system piping, fittings, flanges, unions, etc. Insulation shall be a condensation control jacketed glass fiber pipe covering, 1" thick for pipe sizes 1" & less, 1.5" thick for pipes sizes 1-1/4" through 2 1/2", 2.0" thick for pipes 3 to 4" & 2.5" thick for pipes 5" & above with flame resistant vapor barrier jacket meeting ASTM E84 and UL 723.

Insulation shall be Knauf Permawick or equal by Owens-Corning or Schuller. Provide pre-formed PVC jacket covers over insulated fittings such as els, tees, valves, etc. and over all piping in boiler room (see below).

DUCTWORK INSULATION:

Furnish and install all-service faced duct wrap consisting of a blanket of glass fibers factory-laminated to a reinforced foil / kraft (FRK) vapor retarder facing on all supply, ventilation, and non-lined return air ductwork.

Duct wrap shall comply with NFPA 90 performance standards. Duct wrap insulation shall be Knauf Multi-purpose, 2" thick, 0.75 lb/cf density with installed R-value = 5.6, or approved equal by Owens-Corning or Schuller.

PART II: EXECUTION

Install system according to manufacturer's written instructions. Drawings indicate only general arrangement of piping, fittings, and specialties

PIPE INSULATION INSTALLATION:

The Contractor shall provide all insulation as required on all piping as specified hereinafter and/or as indicated. All insulation shall be installed in a workmanlike manner by qualified workers in the regular employ of the Contractor.

Install insulation according to manufacturer's instructions.

All insulation shall be applied to clean, dry surfaces butting all sections firmly together and finishing as specified hereinafter. All vapor barriers shall be sealed, and shall be continuous throughout. No staples shall be used on any vapor barrier jacket. All vapor barriers shall be of the fire retardant type.

Insulation of all insulated lines shall be interpreted as including all pipe, valves, fittings, and specialties comprising the lines, except flanged unions and screwed unions on hot piping. Insulation over fittings shall be of equal thickness as the adjoining pipe insulation. Unless otherwise specified or directed, insulation for fittings and flanges shall be of the permanent type.

PIPE INSULATION PROTECTION:

Support of pipe shall be on the outside of the insulation. The insulation at each support shall be rigid and of an equal thickness and finish as the adjoining pipe insulation; the length to coincide with the saddles.

PIPE IDENTIFICATION:

Furnish and install flexible, permanent, color-coded, plastic-sheet pipe markers that comply with ANSI A13.1 on all chilled, hot, & condensate piping (including piping above lay-in ceiling & visible from utility platform) not to exceed 15' o.c. manufactured by Seton Products, MSI, or equal. Provide directional arrows. Verify verbage with Engineer, i.e., chilled water supply or return, hot water supply and return, etc.

DUCT SEALANT:

Prior to insulating, all duct joints (except gasketed joints), seams and connections shall be sealed with brush-on type water-based sealant equal to United-McGill Duct Sealant. Apply in accordance to manufacturer's instructions and / or recommendations.

INTERIOR DUCTWORK:

Fully insulate all plenums at exterior wall louvers, and all ductwork for outdoor air, supply air, return air, and kitchen make-up air. Insulate exhaust air ductwork upstream of energy recovery equipment. Insulation is not required for restroom exhaust and exhaust downstream of energy recovery equipment. All duct insulation shall be installed on the exterior of ductwork, unless otherwise noted. Duct liner insulation is specifically prohibited.

Duct insulation shall be all-service faced duct wrap consisting of a blanket of glass fibers factory-laminated to a reinforced foil / kraft (FRK) vapor retarder facing. Duct wrap shall comply with NFPA 90 performance standards. Duct wrap insulation shall be Knauf Multi-purpose, 2" thick, 1.0 lb/cf density with installed R-value = 6.0, or approved equal by Owens-Corning or Schuller.

DUCT INSULATION INSTALLATION:

Before applying duct wrap, sheet metal ducts shall be clean, dry, tightly sealed at all joints and seams as specified, sealant applied and inspected by Engineer.

Duct wrap insulation shall be cut to "stretch-out" dimensions as provided in instructions, and a 2" piece of insulation removed from the facing at the end of the piece of insulation to form an overlapping staple and tape flap.

Install duct wrap insulation with facing outside so that tape flap overlaps insulation and facing at other end of piece of duct wrap. Insulation shall be tightly butted. If ducts are rectangular or square, install so insulation is not excessively compressed at duct corners. Seams shall be stapled approximately 6" on center with outward clinching staples. Where a vapor barrier is required, seal with pressure-sensitive tape matching the facing, either plain foil or PRK backing stock.

Where rectangular ducts are 24" in width or greater, duct wrap insulation shall be additionally secured to the bottom of the duct with mechanical fasteners such as pins and speed clip washers, spaced on 18" centers (maximum) to prevent sagging of insulation. Adjacent sections of duct wrap insulation shall be tightly butted with the 2" tape flap overlapping. Where a vapor barrier is required, seal all tears, punctures, and other penetrations of the duct wrap insulation facing with tape or mastic to provide a vapor tight system.

DUCT LINER:

Removed from Spec, not allowed on this project.

PART III: WARRANTY

Manufacturer shall guarantee all insulation as installed to be free from manufacturing defects for a period of one year from startup not to exceed twenty-four months from shipping to job site under normal use.

PART IV: COMMISSIONING

Prior to pre-final construction review, Contractor shall repair all insulation tears and damage.

END OF SECTION

SCOPE OF WORK:

Provide complete systems of piping and fittings for all services, including water system piping, cold water make-up, valves, fittings, joints, hangers, supports, expansion joints, pipe guides, and insulation.

SUBMITTALS:

Shop drawings shall be submitted for the following:

- a. piping & fittings
- b. welding procedure & qualification specification
- c. valves / strainers / flow control devices / test plugs
- d. gauges

BUILDING PIPE INSTALLATION:

All pipe, valves and fittings shall comply with American Standards Association Code and/or local codes and ordinances (no foreign fittings accepted). Cut pipe accurately to measurements established at building or site, and work into place without springing or forcing, properly clearing all windows, doors and other openings or obstructions. Excessive cutting or other weakening of building to facilitate piping installation will not be permitted. Piping shall line up flanges and fittings freely and shall have adequate unions and flanges so that all equipment can be disassembled for repairs. Test all piping prior to concealing.

All welded pipe and fittings shall be delivered to job with machine beveled ends. Where necessary, beveling may be done in field by gas torch, in which case surfaces shall be thoroughly cleaned of scale and oxidation after beveling. No miter connections will be permitted in welded work.

Screwed piping shall have tapered threads cut clean and true, and shall be reamed out clean before erection. Each length of pipe, as erected, shall be upended and rapped to free it of any foreign matter. All piping shall be closed with factory installed caps until prior to installation.

Threaded fittings shall be malleable iron conforming to ANSI B16.3 (150 psig W.O.); welded fittings shall be standard weight Schedule 40 black steel conforming to ASTM A-120. Weld-o-lets may be used in lieu of fitting for branch take-offs from mains 2" or larger provided that the branch take-offs is two or more sizes smaller than the main. No "stub-ins" will be permitted. Threaded joints shall be made with Teflon sealing compound applied to the male threads only.

The Contractor shall coordinate the routing of all piping with other contractors prior to installation. Furnish and install valves as required to allow for complete system drain down.

ABOVE GROUND PIPING:

Above ground piping inside building shall be Schedule 40 black steel pipe bearing name of manufacturer and weight at regular intervals. Fittings for pipe 2-1/2" and smaller shall be malleable iron 150 lb. screwed and bonded (ASA B16.3). Fittings for pipe 3" and larger shall be welded forged carbon steel (ASTM 234) with same thickness as adjacent piping. Use only long radius elbows.

WELDING QUALITY ASSURANCE

Piping shall comply with the provisions of the latest edition of the ASME code for pressure piping, ANSI/ASME B31.1 - Power Piping.

All welding shall be performed by persons currently having an ASME license in accordance with Section IX of the ASME Code. All welding shall be performed in accordance with the North Carolina Boiler Rules. Names, identification stamps, and copy of certification of all welders on job shall be submitted to the Designer and kept for historical purposes in the project files. At the request of the Designer, this

contractor shall (at his or her expense) have an independent testing agency test and qualify the welding procedures used in the construction of weldments and the performance of welders who apply these procedures.

At least two weeks before any welding is performed, the Contractor shall submit to the Designer a copy of each welding procedure specification required for the job, together with the procedure qualification record as required by Section IX of the ASME boiler and pressure vessel code.

At least two weeks before any welder shall perform any welding the Contractor shall submit to the Designer a copy of the manufacturer's record of welder or welding operator qualification tests as required by Section IX of the ASME boiler and pressure vessel code.

Welded joints shall be made by first properly beveling the surfaces to be welded, cleaning the mating surfaces, then tack-welding the joint to assure proper alignment prior to completing the weld. Weld metal shall be continuous around the joint and shall be deposited in such a manner that the sides and bottom of the surfaces or edges joined are thoroughly fused with the surface of the weld and have proper reinforcement and width.

The first weld of each welder shall be witnessed and visually inspected and approved by Engineer before further welding by that welder is permitted. Provide at least five (5) working days notice to Engineer.

Weld examination shall be in accordance with ANSI/ASME B31.1 - Power Piping. In addition, the Owner may at any time hire an independent agent to examine the welds using whatever method he or she deems suitable, whether required by ANSI/ASME B31.1 or not.

Any welds not meeting the acceptance criteria of ANSI/ASME B31.1 – Power Piping for the examination technique used shall be repaired in accordance with ANSI/ASME B31.1., at no cost to the Owner.

VALVES:

For pipe sizes 3" and larger, valves shall be threaded lug butterfly type, with ductile iron body, teflon or neoprene seat, and bronze disc; Grinnell Series 8000 or equal by Posi-Seal or DEMCO. For pipe sizes 2.5" and smaller, use ball valves non-shock pressure rated up to 400 psi equal to Grinnell Series 3500 with cast bronze body and ball. Soft solder ends at temperatures less than 470°F to prevent damage to seat. Nibco or Apollo shall be considered equal.

Check valves shall be spring loaded, manufactured by Febco, Watts or equal.

STRAINERS:

Strainers shall be placed at pumps, coils, chillers, boilers, make-up water and where indicated on the drawings. Strainer body specs shall be same as valves. Screen element shall be rated for 20 mesh/850 microns up to 1-1/2", perforations shall not exceed 1/16" for 2" units and larger.

AUTOMATIC FLOW CONTROL VALVES / STRAINERS

Combination automatic flow control valves strainers with pressure and temperature parts shall be installed where shown on the drawings to control the water flow to the scheduled values. These valves shall automatically control the flow of water to the units to within 5% of the indicated flow over a pressure range of not less than 14 times the minimum necessary for proper flow. All internal working parts shall be nickel plated brass or type 300 passivated stainless steel. Where indicated on drawings, provide plug blow down drain, manual air vent, add dielectric union options. See details on drawings. Flow control devices shall be Auto Flow FV-BC/SV-BC by Flow Design Inc. or Flow-ConY, or Ultra-Z by Griswold.

TEST PLUGS:

Provide where shown on drawings, 1/4" brass, 1000 psi, 250 degrees F test plugs with Nordel penetrate able membrane for measuring pressure and temperature. The plug shall have a firm fitting brass cap. The case shall have a double insert of Nordel to prevent momentary leakage after long periods of penetration. Test plugs shall be manufactured by Peterson Engineering (Pete's plugs) or approved equal.

PIPE SLEEVES:

Provide pipe sleeves where pipe passes through floors, beams, walls, roofs, etc. Size sleeves for insulated pipe to accommodate both pipe and insulation. Sleeves for piping masonry or concrete walls, floors, beams, or roof, shall be of black steel pipe of standard weight, unless otherwise specified or shown. Vertical sleeves through floors shall extend at least 1" above finished floor.

PIPE HANGERS AND SUPPORTS:

Pipe hangers and supports shall be of a size to support water filled piping with a safety factor of 5 based on hanger or support ultimate tensile strength. Hangers and supports shall be manufactured by B-Line Systems or approved equal by Grinnell or PHD. Size hangers for all insulated piping to fit over insulation with an acceptable clearance.

Clevis hangers for water piping shall be equal to B-Line Fig. 3100. Roller type hangers shall be equal to B-Line Fig B-3110. Vertical pipes shall be supported by wall brackets equal to Grinnell Fig. 261. Hanger rod shall be equal to B-Line Systems Fig B-3205. Pipe insulation protection shield shall be B-Line Fig. 3151. Piping hanger and support installation shall allow for uniform expansion and contraction at all times. Use B-Line Fig. B-3050 or equal universal C-clamps for attachment to structure.

PIPE INSULATION:

See Section 15500, Mechanical Insulation.

INSULATION INSTALLATION:

See Section 15500, Mechanical Insulation.

PRESSURE TESTING:

Test all piping and connections installed under this contract. Do testing prior to painting, backfilling, insulating or concealment within building construction. Trenches may be backfilled prior to pressure tests, but not before work has been visually inspected by the Owner. If pressure tests indicate leaks in piping, it shall be the Contractor's responsibility to determine location of leaks, excavate as required, repair leaks, and backfill at his expense.

Perform each test as specified hereinafter and continue or repeat until the lines under test are proven tight to the satisfaction of the Owner. Furnish all materials, pumps, gauges, plugs, etc., required for tests. Notify the Engineer in advance of tests so he may witness same. Sections of the system may be tested separately, but when so tested, any defect which may develop in a section already tested and accepted shall be corrected and that section retested. Devices or equipment which may be harmed by test pressures shall be removed or protected during tests. After testing, test systems for complete drain-ability by draining all water from piping using permanent caps, plugs, drain valves, etc. Test building water piping at 100 psi for a minimum of 4 hours before it is witnessed by Engineer. Final test system shall be performed at 100 psi for a minimum of 24 hours.

PIPE AND VALVE IDENTIFICATION:

Furnish and install flexible, permanent, color-coded, plastic-sheet pipe markers that comply with ANSI A13.1 on all piping (including piping above lay-in ceiling) not to exceed 15' o.c. manufactured by Seton Products,

MSI, or equal. Provide directional arrows. Verify verbage with Engineer, i.e., chilled water supply or return, hot water supply and return, etc. Stencil-type spray-on pipe labels will not be accepted on this project.

Furnish and install brass valve tags with 1/4" high letters identifying operation / maintenance of piping system.

TEMPERATURE GAUGES:

Thermometer shall be a dial type, minimum 4.5" diameter black on white dial, stainless case, variable angle mount, copper bulb, with magnifying glass cover. Temperature range shall be 30°F to 240°F (-10°C to 110°C) with a 1% scale range accuracy. Approved manufacturers are Weiss, Terice, Marsh Instruments, and Weksler.

PRESSURE GAUGES:

Pressure gauges shall have a minimum 4.5" diameter black on white dial, be stem-mounted, provided with stop locks, have a phosphor-bronze bourdon tube and a corrosion resistant brass movement with a 1% scale range accuracy. Pressure Range shall be selected by Engineer. Approved manufacturers are Terice, Weiss, and Marsh instruments.

THERMOMETER WELLS:

Provide thermometer wells constructed of brass or stainless steel, pressure rated to match piping system design pressure. Provide 2" extension for insulated piping and cap nut with chain fastened permanently to thermometer well.

END OF SECTION

SCOPE OF WORK:

Contractor shall be responsible flushing, cleaning, and purging of hydronic system piping and pre-treatment of system with corrosion and deposit inhibitors plus microbiocide.

System treatment shall be performed by a competent water treatment company.

Provide a single two gallon chemical bypass feeder, ChemTreat no. 70600880 or Owner pre-approved equal by Dearborn or Calgon.

SYSTEM FLUSHING & PRE-CLEANING:

Clean and flush system before fan coil or air handler connection. After flushing system thoroughly, provide a written certification to Architect that the piping system is free of all dirt, trash, grease, oil, foreign objects, etc.

Make fan coil or air handler connection and clean and re-flush system.

Remove and clean all system strainers then replace.

SYSTEM CLEANING & PRE-TREATMENT PROCEDURE:

1. Check to verify the system has no leaks by whatever method is applicable (visual, hardness test of water from AHU condensate pans, dye, pressure monitoring, make up water meter readings, etc.).
2. Check the PRV and make up bypass valve for proper operation. Purge expansion tank and strainers to remove accumulated rust.
3. Install ball valve on strainers.
4. If the water is dirty:
 - A. Drain and refill until the water clears. Purge air.
 - B. If the water remains dirty after circulation, or if the system must be cleaned while on line, start a running flush (bleed off while make up maintains system pressures) until the water clears. Make sure all control valves are cycled so the entire system is flushed.
5. Add cleaners and inhibitors to the system.
 - A. 5000ppm CT 30 Chill Water Systems (CT 23 may be substituted in hot water systems where there is a minimum of copper in the system).
 - B. 200 ppm CL4123
 - C. 200 ppm CL4400
6. Circulate system for 8-24 hours. During this time, blow down at all low points and deadlegs. Cycle all control valves to make certain the entire system is cleaned. Blow out and / or clean strainers as needed.
7. If the entire system will completely drain by gravity, turn off system. Drain and refill with clean water. Circulate water and start a running flush. If the system will not completely drain by gravity, start a running flush.
8. Continue the running flush until samples collected prior to the make up point to meet the following requirements:
 - A. The pH is less than 9.0.
 - B. The water is clear.
 - C. Iron content is <0.5 or as low as it will go (old systems will not normally be <0.5 after cleaning).

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SECTION 15745

HEATING, VENTILATING, AND AIR CONDITIONING
WATER TREATMENT SYSTEMS

9. Monitor the above parameters frequently. If the iron content rises on two consecutive samples and the water is clear, consider the flushing as complete.
10. Add the appropriate inhibitors:
 - A. CL2871: 4500 ppm – chill water
6000 ppm – hot water
 - B. NCL2150: 250 ppm – chill water
250 ppm – hot water (if water will not be >180 degrees F year round)
11. Use and disposal of chemicals and cleaning solutions should comply with appropriate regulations.
12. The system shall have a minimum of each of the following treatments:
 - A. Molybdenum 300 ppm
 - B. Sodium Nitrite 300 ppm
 - C. Tolytriazole 20 ppm

WARRANTY:

Schedule water Treatment Company to take water test samples prior to 11 month warranty inspections.

Make corrections and file report to Architect.

END OF SECTION

DUCTWORK:

Material and thickness: Ducts shall be rectangular and fabricated of prime quality, re-squared, tight-coat-galvanized, steel sheets. All duct construction shall equal or exceed SMACNA "Low Pressure Duct Construction Standards", or SMACNA "High Pressure Duct Construction Standards", depending on system pressure.

DUCT CONSTRUCTION:

All ductwork shall be fabricated from prime, number one grade galvanized sheet metal conforming to ASTM A-924-94, G-90. Gauges for duct sizes shall be minimum as follows:

<u>Low Pressure, <1" ESP</u>		<u>Medium Pressure, <2" ESP</u>	
26 Ga.	Up to 30 inches	26 Ga.	Up to 26 inches
24 Ga.	Up to 40 inches	24 Ga.	Up to 30 inches
22 Ga.	Up to 54 inches	22 Ga.	Up to 36 inches
20 Ga.	Up to 96 inches	20 Ga.	Up to 84 inches

Standard flat slips and drives shall be used on ductwork with long dimensions not exceeding 18". On ductwork over 18" standing S cleats, Ductmate angles or equivalent reinforcing shall be used.

Ducts shall have supplemental stiffening as required to prevent drumming and to provide a structurally sound assembly. All ducts except those to which rigid board type insulation is to be applied shall have all sides cross-broken. All duct dimensions shown on drawings are "inside clear". The sizes of acoustically lined ducts shall be increased accordingly. Ducts shall be smooth on inside.

Fabricate all ductwork to prevent seams or joints being cut for installation of grilles, diffusers, or registers. All duct joints and seams shall be fabricated and installed with joints and seams made air tight.

SPIRAL DUCT:

Where round duct is indicated on the drawings by diameter, provide spiral duct constructed in accordance with ASHRAE and SMACNA standards, and G-60 galvanized steel meeting ASTM A-517. Duct fittings shall be of welded seam construction, and male fitting slip connection shall be a minimum of 2" from bead to end.

Where exposed duct is detailed on the drawings, provide superior fabrication grade double wall insulated spiral duct with 1" thick insulation meeting NFPA 90A flamespread requirements, welds ground smooth, paintable galvanized steel, perforated liner, and paintable flanged type gasketed duct connection fittings.

Spiral pipe shall be manufactured by United McGill, Hamlin Sheetmetal, Lindab, or Spiral Pipe of Texas.

HANGING DUCTS:

Support ducts from building structure in accordance with SMACNA "Low Pressure Duct Construction Standards", or SMACNA "High Pressure Duct Construction Standards", depending on system pressure.

OBSTRUCTIONS AND RESTRICTIONS:

Where possible, avoid locating any pipe, wire, structural member or other obstruction inside of duct. Take particular care to avoid obstructions in elbows. Where obstruction cannot be avoided, the rules specified by SMACNA "Low Pressure Duct Construction Standards", or SMACNA "High Pressure Duct Construction Standards", depending on system pressure, shall apply. Where ducts pass through non-rated walls, protect ducts and/or insulation from contact with wall by .5 inch filler of noncombustible material and flange perimeter of wall opening with sheet metal.

CHANGE IN DUCT SHAPE & DIRECTION:

Where the area at the end of the transformation results in an increase in area from the beginning of the transformation, the slope of the transformation shall meet SMACNA "Low Pressure Duct Construction Standards", or SMACNA "High Pressure Duct Construction Standards", depending on system pressure.

In general, keep changes in direction and changes in shape to minimum permitted by distribution requirements and building conditions. Make turns with ells, as conditions necessitate, in accordance with SMACNA "Low Pressure Duct Construction Standards", or SMACNA "High Pressure Duct Construction Standards", depending on system pressure.

SPLITTERS AND/OR HAND DAMPERS:

Provide splitters or butterfly dampers for adjustment of distribution to respective branches where indicated on drawings and elsewhere as required to properly balance system. Dampers shall meet SMACNA "Low Pressure Duct Construction Standards", or SMACNA "High Pressure Duct Construction Standards", depending on system pressure.

DEFLECTORS:

Provide deflectors at all branch take-offs, and elsewhere as required. Fabricate of galvanized steel sheet of same thickness as used in ductwork of corresponding size. Securely anchor vanes to duct or casing, and brace free-standing edges as specified for turning vanes in elbows.

ACCESS DOORS:

Provide access doors of suitable size where required to service equipment. Fabricate doors of 24 U. S. Gauge galvanized steel hinged to a 24 gauge galvanized mounting frame, and provide with fastening devices to give tight closure on felt gasket. Doors for insulated duct shall be double panel construction with 1" rigid insulation material between metal panels.

ACCESS PANELS:

Construct access panels as specified for access doors, and provide at all locations where any operable device occurs inside ducts, i.e., dampers, controls, filters, louvers, fire dampers, etc.

SPECIALTIES:

Where drawings or specifications require that ducts be insulated, make provision for neat insulation finish around damper operating quadrants, splitter adjusting clamps, access doors and similar operating devices. A metal collar equivalent in depth to insulation thickness (and of suitable size to which insulation may be finished) shall be mounted on duct. Insulation on duct shall extend continuously through walls, etc.

Provide extension collars for outlets, air guide vanes, and other specialties where they occur in the ducts.

DUCT SILENCER:

Provide pre-fabricated sound attenuating duct silencers where indicated on the drawings constructed of minimum 22 ga. galvanized casing metal, perforated metal inner liner with aerodynamic leading & trailing edges constructed in accordance with ASTM E84 for flame & combustion retardancy. Attenuation data shall be provided with submittal. Pressure drop shall not exceed 0.75" w.g. Approved manufacturers are Rink Sound Control and United McGill.

AIR DISTRIBUTION DEVICES:

**DIVISION 15B
SECTION 15800**

**HEATING, VENTILATING, AND AIR CONDITIONING
AIR DISTRIBUTION & ACCESSORIES**

Diffusers, registers, and grilles shall be installed indicated or implied on drawings. All ceiling diffusers and grilles shall be designed to minimize ceiling and/or wall discoloration, and shall be model and finish as indicated on drawings. Air distribution manufacturer and Contractor shall be jointly responsible for and certify delivery or exhaust. (See Testing Section for duct system.)

Items scheduled on the drawings are used for design purposes. Similar units as manufactured by Nailor Industries, Titus, Krueger, Price and Metal*Aire shall be considered equal. Maximum dba shall be 30. If indicated on the drawings, supply and return grilles shall be equipped with volume dampers of the opposed blade type. The dampers are to be adjustable from the face. All grilles, registers and diffusers shall have white baked enamel finish, unless indicated otherwise.

DAMPERS:

Balancing dampers shall be installed at each branch run to allow for proper balance of the system. Each damper shall be supplied with a quadrant locking device which extends beyond the ductwork for external adjustment.

FIRE DAMPERS: See Section 15825

FLEXIBLE CONNECTIONS:

For low velocity duct work (less than 2400 FPM), provide flexible connections at inlet and outlet of each fan connected to ductwork and elsewhere as indicated. Flexible connections shall be 6 inches wide, waterproof and fireproof, and shall be 24 gauge Metaledge Ventfab, as manufactured by Ventfabrics, Inc.

DUCT SEALANT:

Prior to insulating, all duct joints (except gasketed joints), seams and connections shall be sealed with brush-on type water-based sealant equal to United-McGill Duct Sealant. Apply in accordance to manufacturer's instructions and / or recommendations.

CLEANING DUCT SYSTEM:

Upon complete installation of ducts, clean entire system of rubbish, plaster, dirt, etc., before installing any outlets. After installation of outlets and connections to fans are made, blow out entire systems with all control devices wide open.

DUCTWORK INSULATION: See Section 15500, Mechanical Insulation

DUCT LINER:

For ten feet of return duct from air handler connection or where indicated or detailed on the drawings, acoustically line ducts, plenums, and casings with 1" thick liner. See Section 15500, Mechanical Insulation.

FLEXIBLE DUCTS:

Flexible ducts shall be not less than 3' or greater than 8' long of flexible air duct with a sum total of 90° maximum of bends. Flexible duct shall be UL 181 insulated Class 1 rated for medium pressure applications (up to 8" w.g.). Flexible duct shall be ATCO Rubber Products no UPC-018 or as manufactured Owens Corning or approved equivalent. Flexible duct shall meet all requirements of NFPA No. 90A. Duct shall be complete with 1.25" Type B factory applied insulation. Make connection to metal duct take-off with (2) nylon straps over tape.

END OF SECTION

PART I: GENERAL

Provide all labor, materials, accessories, and equipment required to furnish and install louvers as shown on the accompanying plans and specified in this document.

PART II: PRODUCTS

STATIONARY LOUVERS:

Louvers shall have the following features:

- a. The unit shall have a rain proof exterior with a built-in backdraft damper (for exhaust applications)
- b. The blades shall be constructed of not lighter than 14 gauge 6063T5 extruded aluminum @ 3" o.c.
- c. Frame shall be constructed of not lighter than 12 gauge extruded aluminum.
- d. Provide blade edge of vinyl or rubber to give minimum leakage shall be 1 cfm/ft² at 1/2" SP.
- e. Furnish extended sill and insect screen
- f. Finish shall be Kynar 500 with 20 year warranty or approved equal – custom color(s) selected by Architect

Louvers shall be manufactured by Ruskin, Air Balance, Vent Products, Cesco or Reliable.

Submit (3) color samples for approval by the Architect.

PART III: EXECUTION

Install in accordance with SMACNA requirements.

END OF SECTION

PART 1 GENERAL

1.01 WORK INCLUDED: Modular Central Air Handling Units.

1.02 RELATED WORK

- A. Division 15B
- B. Division 16

1.03 REFERENCES

- A. ARI 430 - Standard for Central Station Air Handling Units.
- B. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.
- C. ANSI/AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
- D. SMACNA - HVAC Duct Construction Standards.
- E. ARI 410 - Standard for Forced Circulation Air-Cooling and Air-Heating Coils.
- F. ANSI/UL 900 - Test Performance of Air Filter Units.
- G. AMCA 300 - Reverberant Method for Sound Testing of Fans.
- H. AMCA 301 - Method for Publishing Sound Ratings for Air Moving Devices.
- I. ASHRAE 68 - Laboratory Method of Testing In-Duct Sound Power Measurement Procedure for Fans.

1.04 QUALITY ASSURANCE

- A. Air Handling Units: Product of manufacturer regularly engaged in production of components who issues complete catalog data on total product offering.
- B. Constant Volume Air Handling Units: Certify air volume, static pressure, fan speed, brake horsepower and selection procedures in accordance with ARI 430. If air handling units are not certified in accordance with ARI 430, contractor shall be responsible for expenses associated with testing of units after installation to verify performance of fan(s). Any costs incurred to adjust fans to meet scheduled capacities shall be the sole responsibility of the contractor.
- C. Variable Air Volume Air Handling Units with Variable Inlet Vanes: Certify air volume, static pressure, fan speed, brake horsepower and selection procedures in accordance with ARI 430. Certify units with inlet vanes in wide-open position. If air handling units are not certified in accordance with ARI 430, contractor shall be responsible for expenses associated with testing of units after installation to verify performance of fan(s). Any costs incurred to adjust fans to meet scheduled capacities shall be the sole responsibility of the contractor.
- D. Air Coils: Certify capacities, pressure drops and selection procedures in accordance with ARI 410-87.

1.05 SUBMITTALS

- A. Submit unit performance including: capacity, nominal and operating performance.
- B. Submit Mechanical Specifications for unit and accessories describing construction, components and options.
- C. Submit shop drawings indicating overall dimensions as well as installation, operation and service clearances. Indicate lift points and recommendations and center of gravity. Indicate unit shipping, installation and operating weights including dimensions.
- D. Submit data on electrical requirements and connection points. Include recommended wire and fuse sizes or MCA, sequence of operation, safety and start-up instructions.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site per manufacturer. Units shall ship fully assembled up to practical shipping and rigging limitations. Units not shipped fully assembled shall have tags and airflow arrows on each section to indicate location and orientation in direction of airflow. Each section shall have lifting lugs or shipping skid to allow for field rigging and final placement of section.
- B. Deliver units to site with fan motors, sheaves, and belts completely assembled and mounted in units. Mount motors as specified in Article 2.04 Paragraph F and Article 2.05 Paragraph A.
- C. Store and protect products per manufacturer.
- D. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.07 ENVIRONMENTAL REQUIREMENTS

Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

1.08 EXTRA STOCK: Provide 1 year's supply, at least (6) sets of pleated media filters. See section 15870.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Trane Company; Model: Modular Climate Changer
- B. YORK; Model: Airpak
- C. Carrier; Model: UniFlex 39NX
- D. Substitutions: Under provisions of General Conditions

2.02 GENERAL

- A. Manufacturer must clearly define any exceptions made to Plans and Specifications. Mechanical Contractor is responsible for expenses that occur due to exceptions made.
- B. Fabricate draw-thru type air handling units with fan sections.
- C. Factory shall fabricate air handling units of sizes, capacities, and configurations as scheduled on drawings.
- D. Provide factory installed unit mounting legs to support all sections of units. If unit mounting legs are not provided, manufacturer shall provide a base rail for shipping and mounting purposes. Contractor will be responsible for providing a housekeeping pad when unit mounting device is not of sufficient height to properly trap unit. Unit mounting devices not constructed of galvanized steel shall be chemically cleaned, coated with rust inhibiting primer, and finished with rust inhibiting enamel.

2.03 CASING

- A. Unit shall be constructed of a complete structural frame with removable panels. Removal of side panels shall not affect the structural integrity of the unit. Contractor shall be responsible to provide connection flanges and all other framework that is needed on unit to ensure that removal of unit's panels shall not affect structural integrity.
- B. Panels shall be fully removable to allow for a proper way to thoroughly clean panels of microbial growth and to access internal parts. If panels are not removable, then manufacturer shall provide access sections with doors between all internal components to ensure access and cleanability of the air handler.

C. Construct casing sections located upstream of supply fan for operation at 4 inches water gage negative static pressure and casing sections located downstream of supply fan for operation at 6 inches water gage positive static pressure.

D. All exterior panels and structural frames shall be constructed of G90-u galvanized steel. Casings not constructed of G90-U galvanized steel, casings with welds on exterior surfaces, or casings with welds on interior surfaces that have burned through to exterior surfaces shall be chemically cleaned, coated with rust inhibiting primer, and finished with rust inhibiting enamel in order to prevent premature corrosion and microbial growth. Seal joints between exterior panels and structural frames with closed-cell foam gasketing for air seal and thermal and acoustical break.

E. Casing shall have removable full size access panels or doors as scheduled on drawings. Access doors shall have double wall construction. Provide automotive style neoprene gasketing around full perimeter of access doors to prevent air leakage. Provide "ventlock" style non-corrosive alloy latches operable from the inside or outside of unit. If access doors open against unit operating pressure, provide safety latches that allow access doors to partially open after first handle movement and fully open after second handle movement.

F. Insulate all sections handling conditioned air with 1" thick 1-1/2 lb. per cubic ft. density matt faced fiberglass or equivalent. Install insulation with adhesive. If edges of fiberglass insulation are exposed, the contractor shall be responsible for sealing exposed edges with mastic sealer to prevent erosion into the airstream. Insulation, adhesive, and mastic sealer (if required) shall conform to NFPA 90A.

2.04 DRAIN PAN CONSTRUCTION

Provide sealed double wall drain pans constructed of G90-U galvanized steel exterior panels and G90-U galvanized steel interior liner. Encase insulation between exterior and interior walls. Drain pans shall be sloped in 2 planes; cross break interior pans and pitch toward drain connections to ensure complete condensate drainage. Units with cooling coils shall have drain pans under complete cooling coil section. All drain pan connections will be to the side of the unit to enable proper trapping. Units without 2-way sloped drain pans shall coat drain pans with anti-microbial treatment.

2.05 FANS

A. Provide supply fan section(s) with FC double width, double inlet centrifugal fan designed and suitable for class of service indicated in the unit schedule. Fan shaft to be properly sized and protectively coated with lubricating oil. Fan shafts shall be solid and properly designed so that fan shaft does not pass through first critical speed as unit comes up to rated RPM. Fans shall be statically and dynamically tested as an assembly at the required RPM to meet design specifications. Key fan wheels to fan shaft to prevent slipping.

Provide self-aligning, grease lubricated pillow-block ball bearings selected for L-50 200,000 hour average life per ANSI/AFBMA 9. Extend both grease lubrication fittings to drive side of unit with plastic tubes and zerk fittings rigidly attached to drive side bearing support.

B. Mount fans on isolation bases. Internally mount motors on same isolation bases and internally isolate fans and motors with 1 inch spring isolators. Install flexible canvas ducts between fan and casings to ensure complete isolation. Flexible canvas ducts shall comply with NFPA 90A. If no isolators or flexible canvas duct is provided, then the entire unit shall be externally isolated from the supply duct work and piping by contractor in order to avoid transmission of noise and vibration through the ductwork.

C. Fan sections shall have full height, double wall, hinged, removable access doors on drive side for inspection and maintenance of internal components. Construct doors in accordance with Article 2.03 Paragraph E.

D. Weigh fan and motor assembly at AHU manufacturer's factory for isolator selection. Manufacturer shall statically and dynamically balance fan section assemblies. Fan section assemblies include fan

wheels, shafts, bearings, drives, belts, isolation bases and isolators. Allow isolators to free float when performing fan balance. Manufacturer shall measure vibration at each fan shaft bearing in horizontal, vertical and axial directions. Balance at design RPM's as scheduled on drawings.

2.06 MOTORS AND DRIVES

- A. Factory shall install all motors on slide base to permit adjustment of belt tension.
- B. Fan Motors shall be heavy duty, open drip-proof, operable at 460 Volts, 60 Hz, 3-phase.
- C. V-Belt Drive shall be variable pitch rated at 1.2 times the motor nameplate.

2.07 COILS

A. Coils shall be manufactured by the same company as the supplier of the air handling unit. Install coils such that headers and return bends are enclosed by unit casings.

B. The wet section of the unit as defined as the entering air side of the dehumidification coil to the leaving edge of the drain pan, shall be insulated. The insulated surface shall meet UL 181 requirements. The airstream surface of the insulation shall be constructed or coated such that it is not biodegradable, repels water and it can be cleaned to prevent microbiable growth. The manufacturer's maintenance instructions shall describe the proper cleaning procedures for the unit.

C. Construct coils of configuration plate fins and seamless tubes. Fins shall have collars drawn, belled and firmly bonded to tubes by means of mechanical expansion of tubes. Do not use soldering or tinning in bonding process.

D. Construct coil casings of galvanized steel with formed end supports and top and bottom channels. If two or more coils are stacked in unit, install intermediate drain channels between coils to drain condensate to main drain pans without flooding lower coils or passing condensate through airstream.

E. Water Cooling Coils

- 1. Clearly label supply and return headers on outside of units such that direction of coil water-flow is counter to direction of unit air- flo.
- 2. Coils shall be proof tested to 300 psig and leak tested to 200 psig air pressure under water.
- 3. Construct headers of round copper pipe or cast iron.
- 4. Construct tubes of 1/2 inch O.D. minimum .016 inch thick copper and construct fins of aluminum.

F. Steam Heating Coils

- 1. Clearly label supply and return connections on outside of units.
- 2. Provide non-freeze steam distributing type coils. Pitch steam coils in units for proper drainage of steam condensate from coils.
- 3. Proof test coils to 300 psig air under water and leak test coils to 200 psig air pressure under water.
- 4. Construct headers of cast iron or round copper pipe.
- 5. Inner tubes shall have orifices that ensure even steam distribution across coil face. Direct orifices toward return connections to ensure steam condensate is discharged from coils.

G. Refrigerant Cooling Coils

1. Clearly label suction and liquid connections on outside of units.
2. Proof test coils to 450 psig air under water and leak test coils to 300 psig air pressure under water. Dry insides of coils after testing and seal all connections.
3. Construct suction headers of copper tubing. Suction connections shall penetrate unit casings to allow for sweat connections to refrigerant lines.
4. Coils shall have equalizing type vertical distributors sized in conjunction with capacities of coils.

2.08 FILTERS

- A. Provide factory fabricated filter section of the same construction and finish as unit casings. Filter sections shall have filter guides and full height, double wall, hinged, removable access doors for filter removal. Construct doors in accordance with Article 2.03 Paragraph E. Filter sections shall flange to other unit components. Provide filter block-offs as required to prevent air bypass around filters.
- B. Provide 2 inch angled filter sections with pleated filters. Filters shall be removable from one side(s) of filter sections.
- C. Coated filters shall be coated with an anti-microbial agent to prevent microbes from growing in the filters. The agent is comprised of a silane quaternary ammonium which exhibits permanent chemical bonding capability. The treatment will provide a minimum level of 90% bacterial reduction as compared with an untreated control when tested according to AATCC Test Method 100-1988 or equivalent anti-microbial test and a maximum of 20% fungal growth on the substrate as compared with an untreated control when tested according to AATCC Test Method 30. Anti- microbial materials must be registered with the Environmental Protection Agency under FIFRA and FEPCA and must be used in strict accordance with the registration.

2.09 DAMPERS

Provide dampers to modulate the volume of return air. Damper blades shall be galvanized steel, housed in a galvanized steel frame and mechanically fastened to an axle rod rotating on bearings. Blade seals are required to assure tight closure. All dampers shall be rated for a maximum leakage rate of less than 1 percent of nominal CFM at one-inch w.g.

2.10 GENERAL MODULES

2.11 AIR HANDLING UNIT SCHEDULE: see drawings

PART 3 EXECUTIONS

Install AHU in strict accordance with manufacturer's instructions and SMACNA and NFPA requirements.

END OF SECTION

GENERAL:

Furnish and install 1 year supply of 1" air filters disposable air filters in all fan coils and 2" for air handlers. One year supply consists of four (4) sets for 60 day replacement cycle and does not include first sets installed during start-up and replacement prior to Owner acceptance of building.

Provide an air filter replacement schedule indicating size and quantity for each HVAC with submittal for approval.

Air filters shall be medium efficiency, pleated, disposable type. Each filter shall consist of cotton and synthetic media, media support grid, and enclosing frame. The filter shall be listed and identified on the frame as Underwriters' Laboratories Class 2.

Filter shall have not less than 2.3 square feet of media per square foot of filter face area and not less than 16 pleats per linear foot of filter face area. A 96% open area media support grid of welded wire construction, coated with rust inhibitor shall be bonded to the air exiting side of the filter. The enclosing frame shall be of high wet-strength beverage board with diagonal support members bonded to the air entering and air exiting side of each pleat. The inside periphery of the enclosing frame shall be bonded to the filter pack.

Filter shall have an average efficiency of 25-30%, and an average arrestance of not less than 90% in accordance with ASHRAE Standard 52.1-1992. The minimum MERV when tested under ASHRAE 52.2 shall be no less than MERV 7. Initial resistance at 375 feet per minute approach velocity shall not exceed 0.28" iwc

A test report corresponding to each of the aforementioned ASHRAE Standards are required submittals.

MANUFACTURER:

Filters shall be Farr 30/30.

Units manufactured by Flanders and American Air Filter are acceptable provided all specifications are met or exceeded.

END OF SECTION

PART 1: GENERAL

1.0 SYSTEM REQUIREMENTS:

- A: Furnish and install a complete and operable system for automatic environmental control and energy management. The system shall be installed by mechanics and electricians regularly employed by a factory branch office.
- B: The Controls contractor shall have a minimum of ten (10) years experience in automated controls applications and be able to provide local service from less than 50 miles from the project and within a four (4) hour period in case of emergency.
- C. The Harnett County Public School system will consider previous experience(s) with control contractors prior to awarding contracts. Harnett County reserves the right to require a live system demonstration of the successful vendor's system in respect to the performance requirements set forth in this specification.
- D. The system shall be a complete DDC building automation and control system 100% compatible with the existing and shall be required to be directly compatible with the existing county wide Facility Management System workstation by means of a full binary interface to maintain consistency of operations for Harnett County Personnel. The existing FMS computer shall have full access to the site by means of concurrent real time database transfer between systems with no loss of data retrieved, database storage, down line loading, and field point adjustment.
- E. Any additional hardware or software required to maintain the integrity of the existing county wide system by the addition of controls on this project shall be included in the bid price. Energy Management systems introduced as a part of this project shall in no way alter the integrity of the existing FMS workstation as recommended by the manufacturer.
- E. Companies approved to bid this project subject to the conditions and requirements of the specification are shown below:
 - Reliable Controls
 - Schneider Electric Controls
 - American Automatrix
 - Delta Controls
 - Other equivalent manufacturers as approved by the engineer.

PART 2: PRODUCTS

2.0 SCOPE OF WORK:

- A. The building automation system shall be installed as a turn-key project and shall consist of all sensors, actuators, direct digital controllers, central host computer and electrical control wiring for a complete operating installation as specified herein. All Automation and control products provided on this project shall be in accordance with ISO-9001 certification. ISO-9001 provides a third party, internationally recognized standard of quality which must be met on this project. The system shall be a standard product of the installing organization who will guarantee ongoing parts availability and factory trained support for five years (5) after system acceptance.

2.1 INSTALLATION

- A. All electrical control wiring and terminations for the building automation system shall be provided by the controls contractor unless specifically indicated by others on the drawings or other sections of the specifications. Electrical work specified herein (Work by Others) shall be the responsibility of the Electrical Contractor.

1. All wiring shall be in conduit unless specifically specified otherwise and all wires shall be number coded.
2. Shielded cable, in concealed accessible areas where code allows, shall be acceptable.
3. All panels shall be fabricated in a UL certified panel shop.

2.2 COORDINATION WITH OTHER TRADES

- A. A project supervisor shall be assigned to coordinate all aspects of the project installation. The project supervisor shall be a direct employee of the control systems contractor. The supervisor shall be factory trained in control technology, systems installation and commissioning software based systems.

The project supervisor shall have broad authority to schedule all control work, supervise the installation of control equipment, issue field change orders, provide technical consultation, commission systems, provide acceptance testing, correct punch list items and train the user's operator.

- B. The HVAC contractor shall install all wells, pressure taps for flow sensors, etc., and shall set all control valves in place under the manufacturers supervision. Pressure taps shall include service valves and calibration taps.

The HVAC contractor shall approve the submitted schedule of required control damper quantities and sizes before dampers are ordered from the factory. If dampers are to be custom made for this project, the sheetmetal contractor shall return the approved damper inquiry form to the control manufacturer a minimum of six (6) weeks before dampers are required at the jobsite.

The sheet metal contractor shall receive dampers at the job site, set dampers in place under the manufacturers' supervision and provide an access door for each damper. Dampers shall be mounted square within the duct without twisting or distortion to insure proper damper operation. The damper shaft shall be extended at a location that provides space for mounting the actuator.

Cutting, patching and painting required for the control system installation will be accomplished by the HVAC contractor.

2.3 SUBMITTALS:

- A. The controls sub-contractor shall submit installation drawings, control strategy flow charts, sequences of operation and catalog cut sheets for each device of the proposed system, prior to installation, for engineer's approval.

The drawings shall include the location and inter-communication of all stand-alone control panels; the schematic diagrams of the controlled equipment with sensors and actuators shown interconnected to the system controllers; and logic diagrams that depict the sequence of operation.

- B. After completion of the installation and commissioning of the system including final adjustments, a full set of as-built documentation shall be turned over to the owner. The as-builts shall include one (1) set of reproducible drawings (with room numbers, mechanical rooms with equipment labeled, sensor locations, panel locations and descriptions of areas) and two copies of the data base book to include the system program on a 3-1/2 inch diskette as well as the database printed out for each stand-alone controller or system.

Documentation shall include 3 copies of an operator's and programming manual clearly describing all operation and control strategies for each major piece of equipment being controlled in the installed building automation system. Sections in this manual shall include but not be limited to troubleshooting equipment failures, alarm annunciations, changing setpoints, time scheduling, optimum start/stop, a who to call section, uploading/downloading programs, calibration section, special sections on winter/summer changeover and any other section that may be deemed appropriate by the Energy Management Office.

All Maintenance and Operating Manuals shall include detailed product information on all control hardware including but not limited to relays, sensors, transducers, actuators etc. Any custom control programs shall be documented and explained in English and step by step instructions on how to change parameters and create additional custom control programs. Prior to initial programming, coordinate schemes, strategies and documentation format with the Energy Management Office.

2.4 GENERAL PRODUCT DESCRIPTION

The BUILDING AUTOMATION SYSTEM (BAS) shall be configured as a distributed processing network of direct digital control (DDC) panels (herein after referred to as Network Control Modules and/or Unitary Digital Controllers). The system shall be completely modular and stand-alone in both hardware and software and allow for expansion in both function and capacity. Systems requiring a host processor for any of the system's control operations are not acceptable.

NETWORK CONTROL MODULES:

GENERAL

- A. The stand-alone controller shall be a microprocessor based control unit which can be programmed to automatically supervise and control 250 functional points. Sufficient programmable memory shall be installed in each controller to allow its maximum point configuration.
- B. All stand-alone controllers shall comply with FCC Regulations, Part 15 for Class A computing devices with respect to radiation and conduction of radio-frequency electromagnetic energy.
- C. The controller will be capable of interfacing with 62 field input/output controller on a RS-485 network communicating at 51.2K Baud. Systems operating at speeds less than 51.2K Baud are not acceptable.
- D. Provide a auto-dial/auto-answer modem to allow for remote interrogation of the network. The serial data speeds shall be adjustable between 300 and 14.4K baud. In addition, provide two (2) RS-232C serial data communication ports for simultaneous operation of local and/or remote terminal devices at each Network Control Module.

UNITARY DIGITAL CONTROLLERS

- A. Provide field controllers which will provide the required input/outputs to provide an operable system. These controllers will communicate to the Network Control Module over one of two available RS-485 trunks. Each field controller shall be provided with a RJ-11 jack to allow for troubleshooting and maintenance.
- B. Each point shall be discrete. No multiplexing to a single input or output shall be acceptable. Each field controller will maintain its setpoints, limits, schedules and trending information indefinitely in EEPROM memory. Batteries shall not be required for the maintenance of this information, but shall only be required to maintain the field controllers real-time clock..
- C. The field controller input/output points include sensors, two-state commands, binary counters or analog outputs. The controllers shall have easily accessible terminal strips for connection of input/output wiring. All input/output wiring shall be class II type. I/O voltages shall not exceed 24 volts AC or DC and current shall not exceed 1.0 ampere.
- D. Field Controllers shall be provided as required to meet the requirements of the project and provide for available points for future expansion. Field Controllers shall provide the following types of points.
 - 1. The digital outputs shall be used for two-state command to loads, such as start/stop. The digital outputs shall provide a normally closed or open dry contact output with a minimum contact rating of 0.5 Amp at 24 volts.
 - 2. The digital inputs shall accept 2-state dry contacts for alarm or status monitoring or can count pulses from a energy demand meter.
 - 3. Field Controllers will provide either 1-11 volt DC or 4-20 MA analog output signals. The analog signals must be software scaled to read-out in actual engineering units. Pulse width modulation will not be acceptable.

4. The analog inputs shall accommodate a wide range of industry standard sensors including RTDs, 1000 ohm Balco, 1 to 11 volts or 4 to 20 MA DC. Analog inputs will be scaled to read-out in engineering units, as appropriate.

PROMPTED VISUAL DISPLAY

A. The Visual Display shall provide a easy to read visual display of system parameters and data. The display shall accommodate all operating conditions of the Network Control Module as well as the values and status of the sensors and contacts being monitored or controlled. Service alarms which describe the operating condition of the system must also be displayed. The operator interface will allow the operator to interrogate the system and initiate commands throughout the entire stand-alone or LAN system Time and day and other pertinent program values including all programmed elements may be displayed.

B. The Operator Interface/Visual Display shall have a minimum 16 line by 40 character display with 240 wide by 128 high pixels. The keyboard shall allow access to the entire system and display the following information; real-time data display, override, trending, bar and line graphing, alarms, and scheduling. Provide the capability to change display to provide the owner with a set of screens which organizes information in a logical manner to meet their specific needs. This operator interface must also communicate with other Network Control Modules over the LAN network.

C. The Visual Display may be set up in a rotating display to automatically scan either analog inputs, digital inputs, analog outputs, or relay (digital) outputs, displaying the value or status of each in sequence. For example, the operator can set the system up to provide a continual display/summary of all or a portion of all of the input sensors, displaying for a few seconds at a time, each value, and then advancing to the next sensor. This display mode will continue, uninterrupted until manually stopped by an authorized operator. With the full English display and the automatic scan any operator can tell at a glance what conditions are.

D. The prompted visual display must have the following agency approvals; UL-916, UL-864 (UJKL), and IEEE C62.41 (Certification by CSA) It must also meet ANSI/IEEE C62.41 (IEEE Guide for Surge Voltages in Low Voltage AC Power Circuits)

COMMUNICATION

A. The Network Control Module shall be a microprocessor based control unit which can be programmed to automatically supervise and control 250 functional points. A minimum of four 8-bit microprocessors, each running at 2 Mhz, should be provided to perform processing functions. The network control module must be capable of operating on either a ECHELON or ETHERNET network and support operation of 124 controllers. Sufficient programmable memory shall be installed in each controller to allow its maximum point configuration. The RAM and real-time clock of the Network Control Module shall be backed up by a rechargeable battery which can maintain the system for a minimum of 72 hours. The system clock is to be crystal controlled and shall have an accuracy of +/- 60 seconds per month. On multiple panel systems, the clock shall have the capability of being synchronized by the panel designated as the master.

The stand-alone Network Control Module operating independently or on a LAN shall gather, compute, store and deliver to the central processing unit (CPU) and/or remote printer if desired all necessary information for alarm, maintenance time reminders, trends, logs and energy use data. Communications between field controllers and the network control module shall occur at no less than 51.2K Baud. Communications between multiple network control modules on a LAN shall occur at no less than 1.2MBS. Information may be requested at any time by the owner regardless of the number of users accessing the system. All operation applications shall reside in the Network Control Module and will operate without intervention from the CPU. Editing and overriding local stand-alone panel programs shall be possible remotely via modem, as well as locally at each panel(s) on the network, through the prompted visual display as well as a hand held operators terminal.

SYSTEM SOFTWARE

GENERAL REQUIREMENTS:

A. Each stand-alone Network Control Module or UDC shall be programmable through the integral keypad or peripheral terminal provided. Software architecture shall allow set-up of point types, EMS programs, loops and custom programs. In addition, the Network Control Module/UDC shall allow the building operators a means of interrogating input/output sensor conditions via the keypad and display unit or hand held plug in terminal, or if it is connected, through the Central Processing Unit (CPU).

B. Each Network Control Module keypad will allow access to and programming of each of the other units on the RS-485 Local Area Network (LAN). Each UDC, via the RJ-11 jack will also allow access to each of the other units on the LAN.

C. The stand-alone Network Control Module shall be capable of parenthetical, mathematical calculations and logic decisions as programmed by an operator. Totalizations, optimizations, and internal formatting of data is independent of the CPU command center.

D. The stand-alone Network Control Module shall format all data for recall by the CPU host. Formats shall include such items as Engineering units (KWH, F, C, PSI, etc), function descriptions, times, dates and other information relating to point types.

NETWORK CONTROL MODULE SOFTWARE

A: CONTROL PROGRAMS

Pre-programmed standard functions for HVAC control and energy management shall be provided in each Network Control Module for the following:

1. Time of day scheduling
2. Daylight savings time adjustment
3. Holiday scheduling
4. Temperature Compensated duty cycling
5. Electrical demand limiting
6. Start and stop time optimization
7. Controlling Start/Stop interlock schedules
8. Minimum on/minimum off timers
9. Temperature override
10. Outdoor air enthalpy optimization
11. Maintenance messages
12. Direct digital control-PID
13. Power failure/auto restart
14. User defined programming
15. Data logging

All of these programs must be available with the system provided whether specifically required by the installation or not.

B: Direct Digital Control (DDC)

The system shall provide for direct digital control of HVAC equipment. The DDC algorithm will be full (3) term proportional, integral and derivative (PID) control action. Use of any or all of these terms as well as changing their constants shall be user on-line programmable. Any software loops shall have the ability to control staged control or provide analog direct digital control. All loop parameters shall be user definable and shall include minimum on/off times for each stage control. The system shall be able to utilize industry standard control types, such as floating and modulating control with Proportional control/direct or reverse acting. Integral and derivative must be available for use on every control loop.

C: Secondary LAN (SUBLAN):

The building level local area network SUBLAN will employ industry standard open protocol devices manufactured to Bacnet Compliant standards. The devices shall be labeled "Bacnet Compliant". The use of devices supporting the Bacnet protocol will be used where possible. Devices used for VAV boxes, heat pumps, and rooftop units will be Bacnet certified. A Unitary Bacnet Controller will be provided for and dedicated to each piece of equipment.

D: Trending

Trended points may be digital inputs or outputs, analog inputs or outputs or calculated values. Time interval between samples shall be operator selectable. Trend logs shall be capable of providing history of facility condition and shall continue uninterrupted until the program is manually stopped or altered by an authorized operator. The trends shall be stored in a buffer and be accessible for downloading to a spreadsheet program such as lotus or excel for future interrogation.

HOST CENTRAL PROCESSING UNIT

The Owner already owns a centralized host computer complete with Facility Management Software. Systems installed as a result of this contract must be 100% compatible with this existing system or duplicate all existing Management programs on the new system to include all points added under this contract as well as those already existing on other sites. It is the intention of this specification that the successful bidder provide a system(s) which provides all of the functionality the county now has installed and is utilizing. The management programs that are required to be installed on the Centralized Host Station (CHS) are shown below. If provided controls system is not compatible with existing computer hardware and software, provide the following minimum hardware configuration.

- 80686 DX 400 MHz
- 9 gigabyte hard drive
- 94 megabytes RAM
- 3 1/2" 1.44MB Floppy disk drive / 12X CD-rom
- 17" VGA color monitor
- 3-D graphics card with 8 megabyte VRAM
- Ink Jet printer

Graphical User Interface (GUI)

The CHS shall be completely icon driven, Multi-tasking and employing a graphical operating environment. The GUI shall not only be for real time access to any system(s) on the LAN but shall also allow the operator an easy method of information management. Information management shall mean the massaging and manipulation of any system real time or historical data into integrated applications such as report generators, spreadsheets, X,Y charts, database managers, etc. Complete file management and data transfer such as copying, moving or transferring files, automatic and manual means of "cutting and pasting" of data items from one application to another (via Dynamic Data Exchange or via Windows Clip Board "copy and paste") shall be provided as an integral part of this CHS. This CHS shall be completely Windows "compliant", meaning that a User with experience using Windows shall also be able operate this system with minimum additional training.

Menuing and System Access

This CHS shall provide an easy and absolute method of menuing and system access. The menuing system shall provide the only entry point into all of the CHS's array of applications and programs. This same menuing system shall also serve as the shell for the MS Windows operating system replacing the Windows Program Manager. Any and all the CHS programs, MS Windows or MS DOS programs shall be accessible ONLY through this CHS menuing system. Systems which require the use of MS Windows Program Manager as the shell or entry point to other programs shall not be accepted.

This menuing program shall consist of a series of at least 15 dynamic push buttons. Each menu push-button shall be user configurable to allow access to any of this CHS's applications. A push-button shall display a user selectable ICON and text describing visually and textually the application which it will lead the

user into. As well as starting the application (such as a Dynamic Graphic screen, Word Processor or Spread Sheet) it will also have the capability of bringing up a specific Dynamic Graphic Screens, Word Processing documents or Spread Sheets. As an example, a push-button may be configured to take a User to a specific Dynamic Graphic Screen, thus allowing the menuing system to be the only entry point to any specific Dynamic Graphic Screen. This menuing system shall be able to call another menu or menus and that menu to another menu and so forth allowing complete versatility in how the menuing structure is designed and used.

System Security

System Security shall be on an application by application basis. During the setup or editing of a particular User the System Administrator shall be able to enable or disable the use of any application or function within an application for each user of the system. Each User Security Access Record for this CHS shall list each of the CHS's applications which the User has access and the functions which are permitted from within each of these applications. This shall include enabling or disabling the Windows "System Keys" allowing or not allowing the use of the Windows "Task List" or "Switch To" feature from within any application as well as granting access to any specified non-CHS DOS or Windows programs. Systems employing numeric "matrix" type access level assignments will not be accepted. The Users shall be assigned discrete password names and codes, both of which must be entered in order to have access to any particular application or function within the system. As well as application protection each User shall be assigned to a personalized menu (see Menuing and System Access). This shall allow for each user to have their own discrete menuing system for access into the various applications and Dynamic Graphic Screens. Upon the User logging on to the system this custom menu shall be displayed allowing access into only those applications or Dynamic Graphics presented from this User's menu.

Dynamic Graphics

The Dynamic Graphic portion of this CHS shall allow the operator to access any (see System Security) system information via a "system penetration" method. "System penetration" shall allow the operator to begin at an entire site plan and then zoom in to a particular area for closer inspection and then further zoom in on this area and so on until the detailed color graphic display of a desired portion of the facility is represented. The operator shall be able in this manner to "penetrate" to any desired system information without being required to enter any commands via the keyboard. A minimum of 70 dynamic points shall be displayable on any one screen.

As a minimum, a Graphic screen shall be designed showing the entire facility, each building within the facility, each major piece of mechanical equipment within each building, all of which will display the data for each area dynamically.

Up to 8 different sites (systems) may be displayed dynamically on one screen at a time. These shall be similar or dissimilar systems (see Systems Integration) with any combination of modem or "hardwired" connections to these systems. Systems that allow only one connection at a time will not be accepted.

Dynamic Point display shall be User selectable from at least the following options: standard text readout with font, style, size, foreground and background colors and border style (3D raised or lowered) and color selectable, Slider Bar instruments with the same flexibility as the text point type, Discrete movement animation allowing unlimited User selectable and definable animation displays for items such as dampers, gauges, fans, etc., and multi-state digital or analog animation for animating discrete incremental movement or action such as switches, lights, alarm activity, etc. Screen regions or zones shall be definable for dynamic coloration based on an assigned point. This region shall be a definable Polygon with a minimum of 25 sides. As a minimum at least three different colors will be used to represent the point value. By pointing and clicking on any individual dynamic point the following shall be available for display or modification from within any specific dynamic graphic display, which shall include, but not be limited to:

- the current analog or digital value may be changed; for digital state points the system shall automatically select the logical "change to" state or provide a list of associated states from which to select. For analog point changes a slider bar shall be provided allowing the User to simply click on a up or down arrow button until the desired new value is displayed.

- Charting (X/Y) of a selected point for a user given time frame. The chart shall be "tiled" onto the current display defaulting to occupy no more than one fourth of the screen, the user shall be able to move the window and adjust the size of the chart by simply clicking and dragging on the windowed chart. Trace colors (up to 12) and X scale (from 10 seconds to 999 hours) shall be User configurable. Up to 4 charts shall be displayable simultaneously on one screen.
 - Spontaneous timed override requests; the user shall be able to "on-the-fly" request a timed override for any digital or analog point value. The override may be set to start immediately or for any date and time in the future and to end at any date and time in the future.
 - Point help shall be available for each point displayed on the screen. This shall be a user editable text screen which is windowed over the top of, but not covering, the point in question. This help window will contain information specific to this point and its relationship to the system which is currently displayed.
- Dynamic Screen Links shall be easily placed on the screen by selecting from an on screen list of linkable Dynamic Screens. These links shall be represented by either a dynamic PushButton or "invisible" button. Push-Buttons shall be described by placing an Icon or text on the button face. Invisible buttons shall be used on maps, floorplans and so forth so that a User only need to click on a region or zone on the map or floor plan to link to an associated screen.

Command Buttons shall also be definable for use on any screen. Command Buttons shall be used to execute DOS and Windows programs and associated documents or databases from any Dynamic Graphic Screen. As a minimum these Command Buttons will be used to link each screen to a Sequence of Operation for the system displayed. Trend charts shall also be displayable by clicking on a Command Push-Button assigned to a specific system trend. Linking a trend chart to a Push-Button shall be a matter of selecting from a list of pre-defined trend names.

Systems Integration:

The CHS shall integrate the automation system being installed as a part of this contract with the current automation system now in use at this facility. Systems integration shall be defined as the following:

- 1) All point data from the different systems shall be viewed and manipulated through one common format (see previous section "Dynamic Graphics" for definition of "viewed and manipulated"). Therefore, from the user's perspective, interaction with either of the two or more systems shall be identical in every way.
- 2) Points from any of the different systems may be monitored concurrently on one graphic screen.
- 3) Alarms shall be viewed and handled in a common format.
- 4) Trended data shall be stored in a common database. This shall allow the data to be viewed or manipulated in common reports or charts.
- 5) Panel database Upload and Download shall be supported directly by this CHS for each system being integrated and stored to the hard disk.

System Integrators that do not provide full access and functionality of all systems being integrated will not be accepted. In the event that the automation systems offer dumb or Virtual terminal modes this CHS shall allow access into the panel's terminal mode through the same communications port as all other activity with this automation system is performed, use of a second communications port for this use will not be accepted. Intermediate hardware "gateway" devices shall not be accepted, all systems shall communicate directly with this CHS.

Centralized Scheduling and Modification:

Calendars shall be provided for displaying and modification of any of the SDCs time clock functions. The User shall be able to view an entire month's scheduling at a time. Holidays and Special functions shall be clearly marked on the calendar. Calendars shall be displayed by area served. A list of "served areas" shall be displayable at any time by clicking on a button on the calendar. The User shall only have to click on a "served area" to view its time clock schedule. A Dynamic Graphic shall be attached to each Calendar allowing the User to view this "served area's" real time statistics, a link shall be provided on this same graphic screen to take the User back to the schedule.

Schedule changes may be made by clicking on a day or week and entering the new schedule. Changes shall be permanent or for "one time" or multiple occurrences of varying parameters. Global changes shall be allowed for similar or dissimilar schedules. There shall be no limit to the number of Calendars allowed.

Alarm and System Exception annunciation:

Upon the incidence of an alarm or system exception an alarm or exception window shall be displayed at the bottom of the screen displaying the point in alarm or system exception message, the time and date of the alarm or exception and a predefined alarm message (and optionally printed to a user defined printer, printers and or VT-100 or dumb terminal devices). The operator may suppress the alarm/exception window which will force an Alarm and Exception Status Bar to be displayed at any location on the screen the user selects. This status bar shall be displayed regardless of the application in use including any non-CHS DOS or Windows applications. This status bar shall display the current number of unacknowledged and acknowledged alarms and exceptions, and updating date and time. The User shall be able to selectively enable or disable a reminder in the event there are unacknowledged alarms. This reminder shall be both visual and audible, the visual reminder shall be a series of blinking indicators, the audible shall be any standard PC tone or Windows WAV sound playable through the PC speaker or to a third party sound board and external speaker. The User shall be able to record their own reminder messages and select the frequency at which they will play.

Acknowledgment of alarms shall be from either the Alarm "pop-up" or from the status bar. Acknowledgment shall be by a specific event, date range, class, or specific alarm definition and condition. Upon acknowledging the alarm, the name of the operator acknowledging the alarm and the time and date will be associated with the acknowledgment, this data will be stored to the alarm/exception history file and printed to the chosen printers or terminal devices.

Automatic or manual display of associated Dynamic Graphic Screens and Trend Charts shall be provided for each alarm. This shall, upon the alarm occurrence, cause an associated graphic screen and/or trend chart to be displayed. The operator shall be able to suppress the automatic display and perform the query function manually.

Upon exiting the alarm handling mode the User shall be placed back to the application in use at the time of alarm/exception occurrence.

A Current Alarm screen shall be provided which will dynamically display only alarms that are currently in alarm (still in the excursion state). The User shall be able to select all alarms, acknowledged and unacknowledged, as well as by class definition (i.e.: fire, HVAC, building, etc.). As alarms are returned from their respective alarm states the Current alarm screen shall be dynamically updated to reflect the change. From this Current alarm screen the User shall be able to select an alarm and by clicking on a "query" function button "bring up" an associated graphic screen or trend chart.

Trend Management

The CHS shall automatically perform time based periodic collection of real time point data and subsequently store it to the systems hard disk. There shall be two modes of operation; local collection shall allow the CHS to directly query the SDCs for individual point samples; remote collection shall mean that the SDCs collect and store trend data on individual points and then release the entire trend table(s) upon a request from the CHS. Manipulation and archiving of both types of data collection shall be treated commonly. A trend shall be defined as a group of at least 10 data points. Storage and manipulation of sampled points shall only be limited by disk space. Sampling rates shall be user selectable from instantaneous (once a second or less) to once a week. Collection of data shall be user selectable to start and stop on specific times and dates. Charting of the trend data shall be an integral part of the trend management program. Systems that use a third party graphing package such as Excel or Lotus 123 shall not be accepted. Up to 10 points shall be chartable. Four X,Y charts may be run simultaneously displaying either real time data (instantaneous) or historical. Y scaling shall be either automatic or user selectable for any chart displayed, each chart may have different scaling. X scales shall be user selectable allowing for display of data over a wide range of times and dates. Multiple years of data shall be allowed. The chart display shall be capable of displaying a window of time as short as 15 seconds and up to as long as 4 years. Analytical data shall be displayed for

any of the 10 selected points in a clearly displayed window. This analytical data shall consist of at least the following: Standard Deviation, Simple Average, Cycle High and Cycle Low.

Reporting:

The report section of the CHS shall be the "gateway" to the CHS's database for all solicited and unsolicited data collected, and shall provide an easy means of reporting and information management. The report generator shall be an integral part of the CHS, systems that use third party packages (such as Excel or Lotus 123) for report manipulation shall not be acceptable. Reports on historical trend data shall allow for Daily, weekly, monthly and yearly reporting. These reports shall be completely flexible on the data items to be reported on. The User shall be able to select from a list of predefined reports or select data items on-the-fly. The selection of data items shall not be restricted by panel source. Reports may be up to 25 columns and infinite in length. Reports must be capable of reporting on data that has been collected at varying time intervals. Line interpolation shall be used when data samples are not present for a specific time placement, blank data rows for any time slot in the data columns will not be accepted. Report generator shall allow an operator to easily and quickly define the contents of a report as well as define a print time and date if so desired. Information contained in the reports shall be derived from alarm history, CHS or SDC generated exceptions, trend data and timed overrides. The operator shall be able to compile reports by user, company/department, time and date period, point or points. A combination report may also be printed. The combination report option shall allow the operator to define any or all of the data to be reported on within one compilation. A report definition shall be able to be printed once and destroyed or to be saved for subsequent use. A cover page shall be printed automatically displaying the time, date and the parameters by which the report was compiled.

Multi-tasking

The CHS shall be capable of true multi-tasking capabilities. The User shall be able to use other non-related programs in the CHS while still running all CHS applications with no interruptions. This shall include the use of real time data in other applications. This CHS shall allow Spread Sheet programs to gather data from the SDCs dynamically while running a dynamically updating Graphic screen. Up to 16 applications may collect data dynamically and simultaneously from the SDCs. The CHS shall have the ability to allow the passing of data freely to MS Windows applications which incorporate the use of Dynamic Data Exchange.

SENSORS AND DEVICES

SAFETY/STATUS SWITCHES

A. DIFFERENTIAL LIQUID PRESSURE SWITCHES shall be piped in parallel across all water circuits for positive indication of flow - Example: Heat pump loop, cooling tower loop, heat exchangers and storage tanks. Snap action SPDT switches shall operate form a neoprene slack diaphragm, corrosion-resistant stainless steel diaphragm or copper diaphragm capable of being adjusted through the total pressure range.

Switches shall withstand at least twice the working pressure of the system including any standing head, and have a temperature range exceeding the worst case liquid and ambient temperature range conditions. Provide a NEMA 4 enclosure for the switch assembly. For ease of service and maintenance, install the switch with a 3 valve manifold piped in copper to pressure taps in the liquid lines.

B. CURRENT SENSING RELAY shall be used for pump motor status. The current sensing relay shall be adjustable within three ranges; .1-6amps, 6-40amps and 40-200amps. Contact rating shall be .15amps at 30VDC.

C. DIFFERENTIAL AIR PRESSURE SWITCHES shall be piped in parallel across fans for positive indication of flow. Static pressure sensing tips shall be used for both high and low inputs. Pressure range shall be adjustable between .07 and 1.0" W.C. Snap acting contact shall be rated at 300 VA at 120 VAC.

TEMPERATURE SENSORS:

A. SPACE TEMPERATURE SENSORS shall be of the intelligent type and have a temperature range of -32 to 122 degrees F. The sensor shall be 1000ohm ALPHA coefficient, thin film platinum RTD. The sensor shall have the following optional features: LCD display, On/Off button, Option button, set button, up/Down arrows, Password button and exposed RJ-11 jack. The sensor shall be complete with a decorative cover and suitable for mounting over a standard electrical utility box 48 inches off finished floor.

B. DUCT TEMPERATURE SENSORS shall have an insertion measuring probe 6 inches long with a temperature range of -40 to 250 degrees F. The sensor shall include a utility box and gasket to prevent air leakage and vibration noise. For all mixed air and preheat air applications, install bendable averaging duct sensors with a minimum 5 foot long sensor element.

C. LIQUID IMMERSION TEMPERATURE SENSORS shall have a temperature range of -40 to 250 degrees F. Provide stainless steel thermowells and install sensor probe with heat conductive grease. Probe and sensor head shall be removable without breaking fluid seal. Install sensors in top of pipe for horizontal runs and at a positive slope on vertical runs to prevent condensation from flowing to sensor head.

D. OUTSIDE AIR TEMPERATURE SENSOR shall be mounted in the outdoors where natural air flow occurs, away from any artificial affect from mechanical sources - Example: Windows, doors, cooling towers, exhaust fans etc.

HUMIDITY:

A. DUCT RELATIVE HUMIDITY SENSORS shall be duct mounted devices that produce a linear output over the complete range of 0-100% RH. A thin film polymer sensing element shall respond quickly to changes in humidity and shall be protected from contamination by a sintered filter. The sensor shall be factory calibrated with periodic field recalibration capability. The sensor shall be mounted in a duct probe assembly and be installed only after the construction or renovation area is free of contamination. Accuracy of measurement shall be +2% for 0-80% RH at 68 degrees F., +3% for 80-100% RH.

PRESSURE:

A. AIR PRESSURE TRANSMITTER shall universally measure very low static or differential pressure using a variable capacitance technique. Static pressure shall measure in ranges from 0 to 10 inches water column. Differential air pressure shall have a range of 0 to +/-0.5 inches. Transmitter accuracy, including non-linearity, hysteresis and non-repeatability shall be within 1% of full scale.

METERING:

A. Electrical demand shall be from pulsing dry contacts provided by owner and installed by the Utility Company at the power meter.

SURGE AND LIGHTNING PROTECTION:

A Line voltage protection: The DDC system control panels, (Network Control Modules), shall be powered by 120 VAC circuits provided with surge protection. This protection is in addition to any internal protection provided by the manufacturer. The protection shall be a LA302R manufactured by Delta Lightning Arrestors Inc. or an approved equal.

For all control panel locations with telephone modem a 120KMP1 as manufactured by GSI or equal shall be used to provide AC line and telephone line protection. A grounding conductor, (minimum 12 awg), shall be brought to each control panel from either a driven ground rod or the ground bus in a breaker panel. Conduit grounds will not be acceptable.

B. Inter-unit Communications: All panel to panel data networks that are routed outside or between buildings shall be protected by a GSI 422E or approved equal. The protection device shall match the voltage levels of the inter-unit communications network.

PART 3: EXECUTION

PERFORMANCE TEST

The building level supplier shall demonstrate that all controls are installed, adjusted, and can perform all functions required by the drawings and specifications. When coordinated with the owner, this demonstration may be performed in conjunction with instructions to the owner's operations personnel described below.

Performance test period shall not be less than 346 consecutive hours to demonstrate proper functioning of the complete system. The contractor will continue the test on a day by day basis until the performance standard is achieved. The performance standard will measure the operation of the system at an average effectiveness level of at least 95% for the performance period. Whenever downtime occurs, the contractor will correct the defects before resuming the test. Failure due to an individual sensor or controller shall not count as system down time provided the system records the fault and the average effectiveness level for all sensors and controllers together is at least 99% for the test period.

DEMONSTRATION

Manufacturer's Field Services: Provide the services of a factory-authorized service representative for a minimum of 72 hours to demonstrate and train Owner's maintenance personnel as specified below. The Owner reserves the right to replace any instructor who, in their opinion, does not demonstrate sufficient qualifications.

TRAINING:

The controls sub-contractor shall provide the owner's system operators complete instructions for proper control of the system under all modes of operation. These modes shall include, but not be limited to, summer/winter, occupied/unoccupied, energy management and alarm event sequences. The instructions shall be conducted during normal working hours, Monday through Friday at the job site or at the Energy Management Office as directed by Owner. Training shall be extended to the county's FMS central station computer as it relates to programs installed as part of this contract.

Provide a three (3) day hands-on training session available to all county personnel to teach and demonstrate general DDC control strategy and operation. The session will include classroom training of county personnel on a live system. No more than three students shall share a system during this three day session.

Specific instruction on the system installed as a result of this contract shall consist of both classroom and hands-on training. This training shall be done on-site for a minimum of sixteen (16) hours.

An operator's manual shall provide detailed instructions for operating the installed system. Three (3) copies shall be supplied and utilized in the operator's sixteen (16) hour training curriculum.

QUALITY ASSURANCE CRITERIA:

The building level supplier shall be responsible for complete installation, including the proper operation of the system which also includes debugging of all software and calibration of all devices. The building level supplier shall be in the business of design, installation, and service of the building DDC system similar in size and complexity of this project.

The building level supplier shall be properly licensed in the following disciplines. Electrical contracting with an unlimited classification and mechanical contracting with an H-1 and H-2 class 1 classification. If there are security points specified, such as door contacts, the building level supplier will be licensed through the NC Alarm System Licensing Board.

All equipment supplied by the building level supplier shall be new. The equipment and materials shall be cataloged products of manufactures regularly engaged in the production and installation of HVAC control systems. Products shall be the manufacturer's latest standard design and have been tested and proven in actual use.

The building level supplier shall have a minimum of five years experience in the design and installation of computerized DDC building systems similar in performance to the system specified.

WARRANTY SERVICE:

Provide all labor, material and equipment necessary to maintain beneficial performance of the entire building automation system for a period of one year.(1 year after acceptance of the system or parts) In addition, the successful vendor must warranty all Facility Management System programs required and installed in the Central Station FMS Computer as part of this contract. All work shall be accomplished during normal working hours, Monday through Friday excluding legal holidays. Precaution shall be taken to minimize facility operations. The addition of panels or points on the installed system shall not void warranty.

END OF SECTION

PART I: GENERAL

Control system contractor shall be responsible for selection of the proper control valves including line size, pressure rating, flow-coefficient, shutoff rating and allowable leakage factor. Valves will be turned over to the Division 15 Contractor for installation.

Modulating water valves shall be sized for nominal 5 psi pressure drop and close off. All 2-way valves shall have contoured or characterized throttling plugs with linear (for steam applications) or equal percentage characteristics.

The controls contractor shall calculate the required Cv for each valve. Valve Cv shall be within 100 percent to 125 percent of the Cv calculated.

Fan coil valves and AHU central station actuators shall operate from either a 0-10Vdc or a 4-20ma signal.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Belimo
 2. Delta
 3. Approved equal

2.2 CONTROL VALVES

- A. Valves 1/2 inch through 2 inches shall be ball valve type assemblies industrial quality with bronze bodies and NPT screw type and shall be rated for 600 psig (40 bar) working pressure - or two-way and 400 psig (27 bar) for three-way. The operating fluid temperature range shall be 20' F to 2500 F (-70C to 1200C).
- B. The actuator and its mounting plate shall be capable of being repositioned on the square mounting bracket in 90 degree increments parallel or perpendicular to the pipe. Non-metallic thermal isolation standoffs shall separate mounting plate from actuator with high temperature materials rated for continual use at greater than the application temperature. Valve assemblies without thermal isolation as described above are not acceptable.
- C. The mounting bracket shall be of rigid structural metal incorporating a shaft of stainless steel positioned parallel and perpendicular to the packing and stem to prevent lateral or rotational forces from affecting the stem and its packing. The mounting bracket shall be positioned so as to allow the insulation of the valve body and bracket to allow removal of the actuator without disturbing the insulation. Valves shall have either ISO-5211 style mounting pads or machined mounting surfaces. The shaft shall be supported by an upper bearing.
- D. All control ball valves shall be furnished with a 316 stainless steel ball & stem and carbon and graphite reinforced Teflon O seats and seals.
- E. Ball valves for low pressure steam applications shall have 316 stainless steel ball, stem, and drive shaft and rated at a maximum of 600 psi working pressure. Valves shall be installed in the piping at 45 degree angle from vertical. Valve and actuator mounting bracket shall be fully insulated.
- F. The valves shall have a blow out proof stem design.
- G. Each valve shall be functionally tested by the valve manufacturer.
- H. Flow type for modulation shall have equal percentage and linear flow characteristics for two-way and three-way valves, respectively.

- I. Two-way stem packing shall consist of stacked 'V' ring and spring (live) loaded packing requiring no maintenance. Three-way stem packing shall consist of EPDM O-ring requiring no maintenance and no adjustment to meet complete operating life. Valves requiring packing adjustment throughout the life of the valve are unacceptable.
- J. Valves 3 inches and larger shall be butterfly valves.
- K. Butterfly valves shall be threaded lug type suitable for dead-end service and for modulation to the fully-closed position, with carbon-steel bodies and noncorrosive discs, stainless steel shafts supported by bearings, have flanged-end connections, and EPDM seats suitable for temperatures from minus 20 degrees to plus 250 degrees F. All valves shall have a manual means of operation independent of the actuator. Provide valve manufacturer's insulation casing.
- L. Manufacturer shall provide a two year "no hassle" unconditional warranty from date of installation.

2.3 CONTROL VALVE ACTUATORS

- A. The actuator manufacturer shall have ISO 9001 quality certification.
- B. Actuators shall be Underwriters Laboratories Listed under Standard 873 and Canadian Standards Association Class 4813 02. Actuators shall have European Community (CE) certification.
- C. Actuators used near outdoor air streams shall have NEMA type 2 (IP54) housings for water and moisture resistance.
- D. Actuators shall be mounted on the valve by the manufacturer.
- E. Actuators shall be applied according to the manufacturer's specifications.
- F. Actuators shall be fully modulating or 2-position (with fail-safe mechanical spring return) as indicated on drawings.
- G. The valve actuator shall be capable of providing the minimum torque required for proper valve close-off for the required application.
- H. Each actuator shall have current limiting circuitry or microprocessor overload protection incorporated in its design to prevent damage to the actuator. End of travel switches are not acceptable.
- I. Actuators shall have mechanical spring return for fail safe mode where specified. Battery backup units or storage capacitor type units contained within the individual actuators are not acceptable.
- J. Powering shall be 24VAC, 24VDC, 120VAC, or 230VAC. Feedback signal shall be available to provide a DDC input signal or to drive a second slave or tandem actuator. The actuator shall have the capability of adding auxiliary switches or feedback potentiometer if required.
- K. A release button and optional handle on the actuator shall be provided to allow for manual override on non-spring return assemblies.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Install control valves in strict accordance with manufacturer's published instruction manual.
- B. Install control valves with necessary clearance around ball valve assembly.
- C. Install control valves to provide access for periodic maintenance, including removal.
- D. Insulate valve body, not actuator.
- E. Install control valves to prevent condensate forming on valve body to travel into actuator.
- F. Piping installation requirements are specified in other Division 15 Sections.
- G. Electrical power and control wiring and connections are specified in other Division 15 & 16 Sections

PART 4: COMMISSIONING

Schedule service of factory trained representative to inspect installation and provide instruction on maintenance to Owner.

PART V: WARRANTY

Manufacturer shall guarantee the system as installed to be free from manufacturing defects for a period of 2 years from startup not to exceed 30 months from shipping to job site under normal use.

END OF SECTION

PART I: GENERAL

SCOPE:

Furnish and install at locations shown on the plans or as specified in schedules, variable frequency drives meeting or exceeding the following specifications.

RELATED WORK:

- a. Section 15750 Pumps
- b. Section 15966 Pump Control
- c. Section 15850 Air Handler Equipment
- d. Division 16

REFERENCES:

- a. UL 508
- b. NEC

PART II: PRODUCTS

GENERAL:

- a. Furnish complete variable frequency drives as specified herein for the fans and/or pumps designated on the drawing schedules to be variable speed. All standard and optional features shall be included within the VFD enclosure, unless otherwise specified. VFD shall be housed in a metal NEMA 1 enclosure.
- b. The VFD shall convert incoming fixed frequency three-phase AC power into a variable frequency and voltage for controlling the speed of three phase AC motors. The motor current shall closely approximate a sine wave. Motor voltage shall be varied with frequency to maintain desired motor magnetization current suitable for centrifugal pump and fan control.
- c. An advanced sine wave approximation and voltage vector control shall be used to allow operation at rated motor shaft output at nominal speed without being de-rated. This voltage vector control shall minimize harmonics to the motor to increase motor efficiency and life.
- d. The VFD shall include a full-wave diode bridge rectifier and maintain a fundamental power factor near unity regardless of speed or load.
- e. The VFD and options shall be tested to ANSI/UL Standard 508. The complete VFD, including all specified options, shall be Listed by a nationally recognized testing agency such as UL, CUL, ETL, or CSA
- f. The FDA shall have a DC link reactor to minimize power line harmonics. VFD's without a DC link reactor shall provide a 3% impedance line reactor.
- g. The VFD's full load amp rating shall meet or exceed NEC Table 430-150. The VFD shall be able to provide full rated output current continuously, 110% of rated current for 60 seconds and 220% of rated current for up to 1 second while starting.
- h. An automatic energy optimization selection feature shall be provided standard in the drive. This feature shall reduce voltages when lightly loaded and provide a 3% to 10% additional energy savings.
- i. Input and output power circuit switching can be done without interlocks or damage to the VFD.

PROTECTIVE FEATURES:

- a. Class 20 I²t electronic motor overload protection for single motor applications and thermal-mechanical overloads for multiple motor applications.
- b. Protection against input transients, loss of AC line phase, short circuit, ground fault, over voltage, under voltage, drive over temperature and motor over temperature. The VFD shall display all faults in plain English. Codes are not acceptable.

- c. Protect VFD from sustained power or phase loss. The VFD shall incorporate a 5 second control power loss ride through to eliminate nuisance tripping.
- d. The VFD shall incorporate a motor preheat circuit to keep the motor warm and prevent condensation build up in the stator.
- e. Drive shall have semi-conductor rated input fuses to protect power components.
- f. The drive shall be fitted with output line reactors to limit the rate of output voltage rise over time (dV/dt), reduce motor operating temperature and FRI and EMI. To prevent breakdown of the motor winding insulation, the dV/dt must be below 1500 V/ μ sec per IEC recommendations. The supplier shall include with the quotation the dV/dt values of the drive.
- g. Drive shall catch a rotating motor operating forward or reverse up to full speed.
- h. VFD shall be rated for 100,000 amp interrupting capacity (AIC).

INTERFACE FEATURES:

- a. Local/Hand, Stop/Reset and Remote/Auto selector switches shall be provided to start and stop the drive and determine the speed reference.
- b. Provide a 24 V DC, 40mA max, output signal to indicate that the drive is in Remote/Auto mode.
- c. Digital manual speed control. Potentiometers are not acceptable.
- d. Lockable, alphanumeric backlit display keypad can be remotely mounted up to 10 feet away.
- e. VFD's up to 300 HP shall use the same control panel.
- f. Displays shall be available in 6 languages including English, Spanish and French.
- g. A red FAULT light and green POWER-ON light shall be provided.
- h. A quick setup menu with preset parameters shall be provided on the drive.
- i. The drive shall be fitted with an RS 485 serial communications port and be supplied with software to display all monitoring, fault, alarm and status signals The software shall allow parameter changes to be made to the drive settings as well as storage of each controller's operating setup parameters.
- j. Set point control interface (PID control) shall be standard in the unit.
- k. Floating point control interface shall be provided to increase/decrease speed in response to switch closures.
- l. An elapsed time meter and kWh meter shall be provided.
- m. The following displays shall be accessible from the control panel in actual units: Reference Signal Percent, Output Frequency, Output Amps, Motor HP, Motor kW, kW/hr, Output Voltage, No Load Warning, DC Bus Voltage, Drive Temperature (%until trip) and Motor Speed in Engineering units per application (in percent speed, GPM, CFM,).
- n. Drive will sense the loss of load and signal a no load/broken belt warning or fault.
- o. The VFD shall store in memory the last 8 faults and record all operational data.
- p. Eight programmable digital inputs shall be provided for interfacing with the systems control and safety interlock circuitry.
- q. Two programmable relay outputs shall be provided for remote indication of drive status.
- r. Two programmable relay analog inputs shall be provided and shall accept a direct-or-reverse acting signal. Analog reference inputs accepted shall include 0-10 V dc, 0-10 mA and 4-20 mA.
- s. Two programmable analog outputs shall be provided for indication of drive status. These outputs shall be programmable for output speed, voltage, frequency, amps and input Kw.
- t. Under fire mode conditions the VFD shall automatically default to a preset speed.

ADJUSTMENTS:

- a. VFD shall have an adjustable carrier frequency of 2 of 14 kHz through 60 HP and 2 to 4.5 kHz above 60 HP.
- b. Three variable-torque V/Hz patterns shall be provided with the ability to select a constant torque start pattern for each of them.
- c. Twenty preset speeds shall be provided.
- d. Eight acceleration and eight deceleration ramps shall be provided. The shape of these curves shall be adjustable.
- e. Four current limit settings shall be provided.

- f. If VFD trips on one of the following conditions, the VFD shall be programmable for automatic or manual reset: under voltage, over voltage, current limit, inverter overload and motor overload.
- g. The number of restart attempts shall be selectable from 0 through 10 and the time between attempts shall be adjustable from 0 through 10 seconds.

BYPASS:

Provide a manual bypass consisting of a door interlocked main fused disconnect pad lockable in the off position, a built-in motor starter and a four position DRIVE/OFF/LINE/TEST switch controlling three contactors. In the DRIVE position, the motor is operated at an adjustable speed from the drive. In the OFF position, the motor and drive are disconnected. In the LINE position, the motor is operated at full speed from the AC power line and power is disconnected from the drive, so that service can be performed. In the TEST position, the motor is operated at full speed from the AC line power. This allows the drive to be given an operational test while continuing to run the motor at full speed in bypass. Customer supplied normally closed dry contact shall be interlocked with the drives safety trip circuitry to stop the motor whether in DRIVE or BYPASS mode in case of an external safety fault.

SERVICE CONDITIONS:

- a. Ambient temperature, -10 to 40°C (14 to 104°F).
- b. 0 to 95% relative humidity, non-condensing.
- c. Elevation to 3,300 feet without derating.
- d. AC line voltage variation, -10 to +10% of nominal with full output.
- e. No side clearance shall be required for cooling of wall mount units and all power and control wiring shall be done from the bottom.
- f. Drive shall be capable of operating motor up to 1,000 feet away without derating or field modification.

QUALITY ASSURANCE:

- a. To ensure quality and minimize infantile failures at the jobsite, the complete VFD shall be tested by the manufacturer. The VFD shall operate a dynamometer at full load and the load and speed shall be cycled during the test.
- b. All optional features shall be functionally tested at the factory for proper operation.

SUBMITTALS:

- a. Submit manufacturer's performance data including dimensional drawings, power circuit diagrams, installation and maintenance manuals, warranty description, VFD's FLA rating, certification agency file numbers and catalog information.
- b. The specification lists the minimum VFD performance requirements for this project. Each supplier shall list any exceptions to the specification are identified; the supplier shall be bound by the specification.

MANUFACTURERS:

Variable frequency drives shall be manufactured by the Graham Company, ITT, or equal approved by Owner.

PART III: EXECUTION

START-UP SERVICE:

The manufacturer shall provide start-up commissioning of the variable frequency drive and its optional circuits by a factory certified service technician who is experienced in start-up and repair services. The commissioning personnel shall be the same personnel that will provide the factory service and warranty repairs at the customer's

site. Sales personnel and other agents who are not factory certified technicians for VFD field repair shall not be acceptable as commissioning agents. Start-up services shall include checking for verification of proper operation and installation for the VFD, its options and its interface wiring to the building automation system. Start-up shall include customer operator training at the time of the equipment commissioning.

WARRANTY:

The VFD shall be warranted by the manufacturer for a period of 36 months from date of shipment. The warranty shall include parts, labor, travel costs and living expenses incurred by the manufacturer to provide factory authorized on-site service.

EXAMINATION:

- a. Contractor to verify that job site conditions for installation meet factory recommended and code-required conditions for VFD installation prior to start-up, including clearance spacing, temperature, contamination, dust, and moisture of the environment. Separate conduit installation of the motor wiring, power wiring, and control wiring, and installation per the manufacturer's recommendation shall be verified.
- b. The VFD is to be covered and protected from installation dust and contamination until the environment is cleaned and ready for operation. The VFD shall not be operated while the unit is covered.

END OF SECTION

GENERAL:

The Electrical Contractor shall provide all power wiring to the line side HVAC equipment disconnects, wiring troughs, junction box, etc. Unless noted otherwise, or as indicated on the drawings the HVAC Contractor shall be responsible for final connections using a licensed electrical and furnishing manufacturer's recommended HVAC fuses.

In some cases, the electrical contractor shall furnish and install junction boxes with slack cable for this Contractor's equipment requiring electrical service. This Contractor shall make a connection to the slack cable in the junction box, extend it from that point through a local disconnecting means and make the final connections in this equipment.

All control switches for remote equipment shall be provided with on/off indicator lights at the switch.

Ensure that all rotating equipment has a power disconnect available within sight of the equipment, regardless of whether required by the NEC.

The HVAC Contractor shall also provide all control wiring, conduit, equipment interlocks, low voltage device or motor power connections, and similar in accordance with this section or Division 16 of these specifications. Provide all necessary cabinets, panels, junction boxes, interconnecting signal cabling & associated hardware, transformers, relays, engineering support, etc. for a complete and operational system that executes the specified control sequence of operation.

MOTOR STARTERS, CONTROLLERS AND CONTACTORS:

Motor controllers and contactors shall be as indicated or specified and shall be furnished under each Section of this Division requiring such controllers unless otherwise indicated to be provided in a Motor Control Center under Division 16.

Motor controllers shall, unless otherwise specifically noted, be combination magnetic type, with thermal overload relays and heaters in each phase conductor, with operating coils for 120 volts as noted on the drawings or as required. Maximum trip rating of starters for hermetic motors shall be at least 105% of the nameplate full load current of the motor.

Starters shall be provided with build-in selector switches (H-O-A) or pushbutton stations where required. Combination starters shall be provided with sufficient auxiliary contacts or control relays for control sequence as specified, indicated or as required, and with sufficient auxiliary contacts on its circuit breaker or with control relays so that opening the circuit breaker ahead of the starter unit opens all hot control lines within the starters. All starters furnished under this Section shall be mounted in individual NEMA I enclosures, unless otherwise specified or indicated on drawings. Special requirements are specified in the separate Sections of this Division or indicated on the drawings.

Equipment shall be manufactured by Square D to match equipment furnished under Division 16

ROOM-INSTRUMENT MOUNTING:

Room instruments shall be mounted so that their switching devices are 54" maximum above the finished floor unless a clear space of 30" wide by 48" long for wheelchair access is not available, mount at 48" AFF to comply with the American Disability Act (ADA).

CONTROL WIRING:

Run control wiring in metallic raceway in masonry walls, boiler room and exposed conditions. All other signal cables shall be run on utility platform on wire management bridle hooks provided by this contract. Do not run inside raceway with power conductors. Use copper wire or control cable, #18 minimum

DIVISION 15B
SECTION 15975

HEATING, VENTILATING, AND AIR CONDITIONING
ELECTRICAL WORK

(except that digital signaling can be NEC class 2). The contractor shall connect to junction box(s) or other termination points provided by the Electrical Contractor for control power. See Electrical Section of these specifications for materials and installation requirements. All wiring shall be color and number coded.

RELAYS:

Indexing relays shall be 24 VAC coils "relay in a box" with pilot light & off/on switch, IDEC or equal. All line side relay wiring shall be 12 AWG and run in metallic raceway. Relays shall be installed in NEMA 1 enclosures.

CONTROL CABINETS:

Control cabinets shall be provided for mounting of control devices in utility platform and/or boiler room. Cabinet shall be UL listed lockable, code gauge gray painted steel, with knockouts, and hinged door. Enclosure shall be equal to Austin Co. CT series

Provide boiler room cabinet enclosure with swing-down table shelf for use with laptop computer.

CORRDINATION OF ELECTRICAL POWER REQUIREMENTS:

Mechanical contractor shall coordinate voltage and amperage requirements for all HVAC equipment with the Electrical Contractor prior to ordering equipment submittals. Make adjustments to equipment voltage or phase requirements as necessary to match electrical power being provided. Make engineer/architect aware of any conflicts or issues.

END OF SECTION

ADJUSTMENT AND TRIAL RUNS:

Upon completion of all work, the Contractor shall operate the plant in the presence of the engineer for the purpose of demonstrating quiet and satisfactory operation, the proper setting of controls, safety and relief valves, and cleanliness of system. Heating and cooling shall be tested separately during periods approaching the design conditions and shall fully demonstrate fulfillment of capacity requirements. Test procedures shall be in accordance with applicable portions of ASME, ASHRAE and other generally recognized test codes as far as field conditions will permit.

AIR BALANCING & TESTING:

Air Balancing and System Testing includes (1) balancing air distribution, (2) adjustment of total system to provide design quantities, (3) electrical measurement, (4) verification of performance of all equipment and controls, and (5) sound and vibration measurement. Contractor shall provide all required instrumentation and equipment required to obtain proper measurements. Contractor shall perform final test and balance of selected areas in presence of Engineer. The following procedure is adapted from the 1995 ASHRAE Applications Handbook, Ch. 34: Testing, Adjusting and Balancing, and Associated Air Balance Council:

- (1) All supply and return air-duct dampers are set at full open position. All diffuser and side-wall grilles are set at full open position. Outside-air damper is set at minimum position. All Controls are checked and set for full cooling cycle. Branch liner splitter dampers are set to open position. All extractors and distribution grids are set in wide-open positions.
- (2) Drill all probe holes for static-pressure readings, pitot tube traverse readings, and temperature readings. Check motor electric current supply and rated running amperage of fan motors. Check fan and motor speeds. Check available adjustment tolerance.
- (3) Make first complete air-distribution run throughout entire system, recording first-run statistics. Using pitot tube traverse in all main ducts, branch ducts, and supply and return, proportion all air in required amounts to the various main-duct runs and branch runs. Make second complete air-distribution run throughout entire system for check on proper proportion of air.
- (4) Using pitot tube traverse, set all main-line dampers to deliver proper amount of cfm to all areas. Using pitot tube traverse, set all branch-line dampers to deliver proper amount of cfm to diffusers amount of cfm to diffusers and side-wall supply grilles in each zone. Read cfm at each outlet and adjust to meet requirements. Test and record all items as listed on attached form.

Final air balancing form (3 copies) submitted to Engineer shall be on attached form adapted from the Associated Air Balance Council (AABC) and the National Environmental Balancing Bureau (NEBB).

HYDRONIC BALANCING & TESTING:

Hydronic Balancing and System Testing includes (1) bleeding air at all system high points, (2) adjustment of total system to provide design flows, (3) pressure drop measurements & head loss calculations, (4) verification of performance of all pumps, automatic control valves and system controls, and (5) sound and vibration reduction. Contractor shall provide all required instrumentation and equipment required to obtain proper measurements. Contractor shall perform final test and balance of selected equipment in presence of Engineer. The following procedure is adapted from 1995 ASHRAE Applications Handbook, Ch. 34: Testing, Adjusting and Balancing, and the Bell & Gossett Engineering Design Manual:

- (1) Perform air test & balance as specified above.

- (2) Flush & clean system as specified Section 15745. Remove & clean all strainers. Verify correct pump rotation. Pumps shall operate air-free without cavitation. Set automatic fill valves to required pressure.
- (3) Check expansion tanks to verify if system is not water-logged or air-locked. Check all manual air-vents installed at all system high points - bleed all air out of system completely.
- (4) Set all valves at full open position. Close coil bypass valves. Set temperature controls for full flow through all coils.
- (5) Verify correct operation of all automatic control valves. Set operating temperature of chillers to design leaving water temperature.
- (6) Take differential pressure measurements across all pumps & coils. Take power measurements of pump motors in watts (power factor calculated). Use pump manufacturer's published pump curves to determine flow rate.

END OF SECTION

AIR BALANCE REPORT

Project: _____
 Contractor: _____
 Date: _____
 Air Balanced by: _____
 Instrument Mfr #: _____
 Date Calibrated: _____

System No. _____
 CFM: _____
 S.P.: _____
 Fan RPM: _____
 Motor Voltage: _____
 Motor Amperage: _____

Location	No.	Model/Size	Effective	Design Values		Field Test		Final Test		% DEV.
			Area	FPM	CFM	FPM	CFM	FPM	CFM	
	1									
	2									
	3									
	4									
	5									
	6									
	7									
	8									
	9									
	10									
	11									
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	19									
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	21									
	22									
	23									
	24									
	25									

PROCEDURE/NOTES:

- (1) Review Specification Section 15980 prior to air test & balance.
- (2) Ensure fan is providing specified air volume within 5%.
- (3) Set all dampers to full open position prior to first field test.
- (4) Identify air distribution device nos. on HVAC as-built drawing.
- (5) Adjust dampers accordingly and recheck entire system as required.
- (6) Acceptable % deviation is +/-10%.

EVALUATION:

Upon completion of all work, the Contractor shall operate the plant in the presence of the engineer for the purpose of demonstrating quiet and satisfactory operation, the proper setting of controls, safety and relief valves, and cleanliness of system. Heating and cooling shall be tested separately during periods approaching the design conditions and shall fully demonstrate fulfillment of capacity requirements. Weather-dependent test procedures that cannot be performed by simulation shall be performed in the appropriate climatic season. When simulation is used, the Contractor shall verify the actual results in the appropriate season.

The Contractor shall make the observations, adjustments, calibrations, measurements, and tests of the control systems, tune the controllers, set the timeclock schedule, and make any necessary control-system corrections to ensure that the systems function as described in the sequence of operation. The Contractor shall permanently record, on system equipment schedule, the final setting of controller proportional, integral and derivative constant settings, setpoint, manual reset setting, maximum and minimum controller output, and ratio and bias settings, in units and terminology specific to the controller.

Test procedures shall be in accordance with applicable portions of ASME, ASHRAE, NEBB and other generally recognized test codes as far as field conditions will permit.

CLEANING:

All surfaces on metal, pipe, insulation covered surfaces, and other equipment furnished and installed under this section of the specifications shall be thoroughly cleaned of grease, scale, dirt, and other foreign materials. Prior to final inspection, all equipment having factory finishes shall be thoroughly cleaned inside and outside. All damaged surfaces shall be replaced or refinished by Contractor, with paint same as original manufacturer. Engineer shall determine whether the damaged surface is to be replaced or painted.

EQUIPMENT IDENTIFICATION:

Provide black-on-white laminated plastic name plates for each AHU & FC equipment unless indicated otherwise on the drawings. The name plate shall be engraved to indicate the equipment controlled or identified. Name plates shall be securely fastened to equipment using two screws.

MAINTENANCE AND OPERATING MANUALS:

Upon completion, the MC shall turn over to the Architect three (3) sets of complete Operation and Maintenance Manual and parts list for all mechanical equipment used on the job. Manuals shall include submittal data, manufacturer's recommended maintenance, warranties, and name, address, and phone numbers, both Contractor and of suppliers of equipment.

The Operation and Maintenance Manual shall include in addition to manufacturer's operation and maintenance guides and parts list, a maintenance schedule indicating recommended frequency of service, a blank service repair log for recording date, description of maintenance, and parts purchased, and an air filter replacement schedule indicating size and quantity for each HVAC unit.

INSTRUCTION & TRAINING:

Upon completion of the work, and at a time designated by the Architect, with no less than 10 days prior notice, a competent employee of the Contractor shall be provided for a period of not less than one (1) day to instruct a representative of the Owner in the operation and maintenance of the equipment. Systems requiring manufacturer's representative as specified elsewhere shall be scheduled in same manner. Instruction periods shall be as designated by the Owner and shall not necessarily be consecutive.

END OF SECTION

SCOPE OF WORK:

The scope of work consists of the furnishing and installing of complete electrical systems including miscellaneous systems. The Electrical Contractor (hereafter referred to as "the Contractor", or Electrical Contractor) shall provide all supervision, labor, materials, equipment, machinery, and any and all other items necessary to complete the systems. The Contractor shall note that all items of equipment are specified in the singular; however, the Contractor shall provide and install the number of items of equipment as indicated on the drawings and as required for complete systems.

It is the intention of the Specifications and Drawings to call for finished work, tested and ready for operation.

Any apparatus, appliance, material, or work not shown on the drawings but mentioned in the specifications, or vice versa, or any incidental accessories necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be furnished, delivered, and installed by the Contractor without additional expenses to the Owner.

Minor details not usually shown or specified, but necessary for proper installation and operation, shall be included in the Contractor's estimate, the same as if herein specified or shown.

With submission of bid, the Contractor shall give written notice to the Architect of any materials or apparatus believed inadequate or unsuitable, in violation of laws, ordinances, rules, and any necessary items or work omitted. In the absence of such written notice, it is mutually agreed that the Contractor has included the cost of all required items in his proposal, and that he will be responsible for the approved satisfactory functioning of the entire system without extra compensation.

NOTICE TO BIDDERS, INSTRUCTIONS TO BIDDERS, SUPPLEMENTARY INSTRUCTIONS, GENERAL CONDITIONS, SUPPLEMENTARY GENERAL CONDITIONS, SPECIAL CONDITIONS, GENERAL REQUIREMENTS bound in the front of this document are included as a part of the specifications for this work.

ELECTRICAL DRAWINGS AND SPECIFICATIONS:

The electrical drawings are diagrammatic and indicate the general arrangement of fixtures, equipment, and work included in the contract. Consult the architectural, structural and mechanical drawings and details for exact location and dimensions of fixtures and equipment; where same are not definitely located, obtain this information from the Architect.

The Contractor shall follow drawings in laying out work and check drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions at all points. Where headroom or space conditions appear inadequate, the Architect shall be notified before proceeding with installation. If directed by the Architect, the Contractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.

The plans and these specifications are intended to describe, imply and convey the materials and equipment as well as necessary labor, required for the installation as outlined in the paragraph entitled "Scope of Work". Any omissions from either the drawings or these specifications are unintentional, and it shall be the responsibility of this Contractor to call to the attention of the Architect or Engineer any pertinent omissions before submission of a bid. The drawings which accompany these specifications are not intended to show in complete detail every fitting which may be required; however wherever reasonable implied by the nature of the work, any such material or equipment shall be installed by this Contractor as a part of his contract price. In no case will any extra charge be allowed unless authorized in writing by the Architect or Engineer.

The Contractor shall arrange with the General Contractor for required concrete and masonry chases, openings, and sub-bases so as not to delay progress of work. Work shall be installed sufficiently in advance of other construction to conceal piping and to permit work to be built in where required.

It shall be understood and agreed by all parties that where the words "Furnish", "Install", and / or "Provide" appear, the following definitions apply:

Furnish - to supply or give.

Install - to place, establish or fix in position.

Provide - to furnish and install as defined above.

CODES, PERMITS, AND FEES:

The Contractor shall give all necessary notices, including electric and telephone utilities, obtain all permits, and pay all government taxes, fees, and other costs, including utility connections or extensions in connection with his work file all necessary plans, prepare all documents, and obtain all necessary approvals of all governmental departments having jurisdiction at each phase of construction as required; obtain all required certificates of inspection for his work and deliver same to the Architect before request for acceptance and final payment for the work.

The Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus, drawings (in addition to contract drawing and documents) in order to comply with all applicable laws, ordinances, rules, and regulations, whether or not shown on drawings and / or specified.

All work and materials under this section shall be in strict compliance with more stringent requirements of the North Carolina State Building Code, including the National Electrical Code, NFPA 101-Life Safety Code, Regulations of the State Fire Marshall, UL Directory of Electrical Construction Materials, and requirements of the local utility company.

VERIFICATION OF DIMENSIONS, DETAILS, EXISTING FIELD CONDITIONS:

The Contractor shall visit the premises prior to bidding, and thoroughly familiarize himself with all details of the work, working conditions, verify dimensions in the field, provide advice of any discrepancy, and submit shop drawings of any changes he proposes to make in quadruplicate for approval before starting any work.

The Contractor shall install all equipment in a manner to avoid building interference.

CORRDINATION WITH EQUIPMENT PROVIDED BY OTHERS:

Electrical contractor shall coordinate voltage, phase and amperage requirements for all Plumbing, HVAC, and Kitchen equipment with the sub-contractor providing the equipment prior to ordering electrical gear submittals. Make adjustments to panels, feeders, and breakers as necessary to feed actual equipment being provided. Make engineer/architect aware of any conflicts or issues.

ACCEPTABLE MANUFACTURERS:

Acceptable manufacturers, as specified in the Contract Documents, implies that the specified manufacturer may produce acceptable products equal in quality of materials and performance to such item specified. The Contractor will be required to provide products meeting, or exceeding the "Standard of Quality and Performance" as dictated by the product selection noted. However, any changes which result (from substitution of other manufacturers) in the electrical work or work of other Contractors, shall be paid for by the Contractor.

SHOP DRAWINGS:

The Contractor shall submit five (5) copies of the shop drawings to the Architect for approval within thirty (30) days after the award of the general contract. If such a schedule cannot be met, the Contractor may request in writing for an extension of time to the Architect. If the Contractor does not submit shop drawings in the prescribed time, the Architect has the right to select the equipment.

Provide manufacturer's cuts of items to be provided under this Contract. Included, but not limited to these items, are any of the following which may be required in this Contract: Fixtures, switches, outlet boxes, device plates, panelboards, transformers, conductors, pull boxes, wiring troughs, circuit breakers, disconnect switches, emergency fixtures, receptacles, etc.

The shop drawings shall be neatly bound in five (5) sets and submitted to the Architect with a letter of transmittal. The letter of transmittal shall list each item submitted along with the manufacturer's name.

Approval rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are approved, said approval does not mean that drawings have been checked in detail; said approval does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the contract drawings and specifications.

COORDINATION WITH OTHER TRADES:

Coordinate all work required under this section with work of other sections of the specifications to avoid interference. Bidders are cautioned to check their equipment against space available as indicated on drawings, and shall make sure that proposed equipment can be accommodated. If interferences occur, Contractor shall bring them to attention in writing, prior to signing of contract; or, Contractor shall at his own expense provide proper materials, equipment, and labor to correct any damage due to defects in his work caused by such interference.

INSPECTION AND CERTIFICATES:

On the completion of the entire installation, the approval of the Architect and Owner shall be secured, covering the installation throughout. The Contractor shall obtain and pay for Certificate of Approval from the public authorities having jurisdiction. A final inspection certificate shall be submitted to the Architect prior to final payment. Any and all costs incurred for fees shall be paid by the Contractor.

EQUIVALENTS:

When material or equipment is mentioned by name, it shall form the basis of the Contract. When approved by the Architect in writing, other material and equipment may be used in place of those specified, but written application for such substitutions shall be made to the Architect as described in the Bidding Documents. The difference in cost of substitute material or equipment shall be given when making such request. Approval of substitute is, of course, contingent on same meeting specified requirements and being of such design and dimensions as to comply with space requirements.

EXCAVATING AND BACKFILLING FOR ELECTRICAL WORK:

Refer to Sections 02202, 02220 and 15150.

CUTTING AND PATCHING:

On new work, the Electrical Contractor shall furnish sketches to the General Contractor showing the locations and sizes of all openings and chases, and furnish and locate all sleeves and inserts required for the installation of the electrical work before the walls, floors, and roof are built. The Electrical Contractor shall be responsible for the cost of cutting and patching where any electrical items were not installed or where incorrectly sized or located. The Contractor shall do all drilling required for the installation of his hangers. See also Section 01050.

END OF SECTION

CONDUIT SYSTEM:

Furnish and install all conduits, or other raceways, fittings, boxes, and other component parts specified or required for completion and proper operation of the conduit system shown on the drawings.

Other than as noted above, conduit shall be sized in accordance with the 2005 NEC. All conduit shall be neatly installed parallel to, or at right angles to beams, walls and floors of the building in a neat and workmanlike manner. All bends shall be made with standard conduit elbows or conduit bent to not less than the same radius as that of a standard conduit elbow. Conduits shall be supported at intervals not greater than 8' and within 3' of any bend, cabinet, outlet or junction box. Conduits shall be supported by approved pipe straps or clamps, secured by means of toggle bolts on hollow masonry, expansion shields and machine screws or standard pre-set inserts on concrete or solid masonry, machine screws or bolts on metal surfaces, and wood screws on wood construction.

Conduit 1/2" (minimum) and larger shall be electrical metallic tubing (EMT). EMT shall be cold-rolled steel tubing with a coating on the outside and protected on the inside by a zinc, enamel, or equivalent corrosion-resistant coating and conforming to the requirements of ANSI C 80.3-1966 or later edition. EMT may be installed in dry construction in furred spaces, in partitions other than concrete and solid plaster, or for exposed work except on mechanical structures or supports, or in refrigerated areas. EMT shall not be installed where: it will be subject to physical damage; where it will be installed nearer than 4' from finished floor in exposed areas; where it will be subject to severe corrosive influence; where the trade size is larger than 2"; or where tubing, elbows, couplings, and fittings would be in concrete or indirect contact with the earth. Electric metallic tubing fittings shall be all plated steel hexagonal threaded compression type, with insulated throats. No pot metal, set screw, or indenter fittings shall be used.

Connections to lighting fixtures will be permitted with flexible steel conduit strapped every 6'-0", with UL listed AC type cables, used in strict accordance with 2005 NEC Article 333. Armored Cable assembly shall encase conductors in a continuous length of galvanized cold rolled steel strip, spirally wound with adjacent strips locked to turn all edges inward. The ends shall be terminated with fiber bushings to protect conductors from sharp edges. Fittings shall be the insulated throat type, T & B 3100 series or equivalent.

All underground conduit shall be UL Listed Schedule 40 PVC conforming to Article 347 of the 2005 NEC, or rigid galvanized steel. At the Contractor's option, this installation may consist of rigid steel conduit with PVC coating, minimum of 15 mils of PVC. Where schedule 40 PVC is installed under floor slabs, the elbows required to turn the raceway up into cabinets, equipment, etc., shall be of rigid steel. A copper ground wire shall be installed in all PVC conduits. PVC conduit shall not be used above the floor slab, unless roughed-in masonry wall.

All exposed conduit to 5'-0" above finish floor shall be rigid galvanized steel or IMC conduit. Liquid-tight flexible steel conduit with an extruded PVC jacket shall be used for connections to exterior motors and compressors. Liquid-tight flexible conduit fittings shall be insulated throat type, Appleton STB type or equal.

All permanent conduit stub-outs shall be sealed with galvanized standard water pipe caps immediately after installation. All conduits crossing expansion joints shall have approved type expansion fittings as manufactured by Crouse Hinds, Killark or Appleton. Fittings shall be of type to ensure ground continuity. Provide a 240 lb. tensile strength poly pull-wire in all empty conduits.

OUTLETS AND PULL BOXES:

All boxes shall be UL labeled or listed by an approved agency. At each location where required, an outlet box of a type to suit the intended use shall be installed. Boxes shall be fastened to building structure in an approved manner. Flush outlet, junction and pull boxes shall be pressed galvanized or sheradized steel, either square or octagonal with knockouts on tops and sides, and fitted with plaster covers where necessary to set flush with the finished surface. For use in hollow-core masonry walls, switch boxes shall be of sufficient depth to permit conduit to rise in the core with minimum cutting of block. Provide plaster rings or box extensions for flush devices with finish surface. Boxes for unplastered masonry walls shall be masonry type with device mounting ears on the interior of the box.

Convenience outlet boxes shall be generally mounted approximately 18" above floor, 48" above floor in mechanical equipment rooms and shop type areas, and 4" above counter backsplash, unless otherwise noted. Convenience outlets for drinking fountains shall be installed behind fountain enclosure so as not to be visible; coordinate with Plumbing Contractor.

Lighting switch outlet boxes shall be 4' above floor, unless noted or required otherwise. Where switches occur in 4' high tile walls, they shall be lowered by 6 inches.

Pull boxes shall be used as required in long runs of conduit to facilitate pulling of wires. All interior pull boxes shall be constructed of code gauge galvanized sheet metal, and not less than the minimum size recommended by the NEC. Boxes shall be furnished with screw-fastened covers. When several feeders pass through a common pull box they shall be tagged to indicate clearly their electrical characteristics, circuit number, and panel designation. Wire markers shall be as manufactured by W. H. Brady Co., or equal. In no case shall a pull box be installed in an inaccessible location. Boxes shall be provided with fixed or removable steel barriers for each circuit where two or more feeders pass through the box. In case of banked conduit runs consisting of more than two horizontal rows of conduits, where barriers would be impracticable, the cables for each conduit shall be tied together with heavy waxed twine and wrapped with one wrap of heavy grade tape.

Where two or more outlets are to be installed in one location, they shall be installed in gang boxes suitable for the intended purpose.

Outlet boxes for outdoor use, and for exposed use where not covered by fixture canopies, shall be cast metal suitable for the intended purpose, having integral threaded hubs, and of the weatherproof type with gasket. Provide special outlet boxes where indicated.

All junction boxes shall be marked with panel and circuit number which it contains.

END OF SECTION

CONDUCTORS FOR 600 VOLTS OR LESS:

All conductors shall be copper with a minimum conductivity of 98% and shall be delivered to the job site in their original packages, marked or tagged as follows : UL label , size, type, and insulation of the wire; name of manufacturer and trade name of the conductor: and date of manufacture. All conductors shall be insulated for 600 volts unless otherwise indicated. Furnish and install all conductors specified or required for completion and proper operation of the various systems shown on the drawings.

Conductors shall be 600 volt type THW or THWN. Branch circuit conductor shall not be smaller than No. 12 AWG, except where specifically noted otherwise. Home runs originating more than 80' at 120 volts from panel location shall be No. 10 AWG minimum size. Wires No. 10 AWG and smaller shall be solid; wires No. 8 AWG and larger shall be stranded. Where branch circuits are fed through fluorescent fixture channels, use code grade type THHN or XHHW. All AC cables where permitted shall include a separate copper ground conductor sized per phase conductors.

Provisions of Section 210-5, Color Code, NEC, shall be strictly complied with. Color coding shall include feeders and mains and be consistent throughout entire system. For 120/208 volt systems, use black, red, and blue for phases A, B, & C respectively. For 277/480 volt systems, use brown, orange, and yellow for phases A, B, & C respectively.

All conductors in vertical raceways shall be properly supported at intervals not greater than those specified in Section 300-19 of NEC.

All wire and cable except as specifically stated otherwise, shall be of one of the following makes: Anaconda Wire and Cable Co., General Cable Corp., General Electric Co., or Okonite Co.

JOINTS AND CONNECTIONS:

The Engineer reserves the right to inspect any and all joints made in wiring. If they are taped prior to being inspected, the tape shall be removed as ordered from any joint or joints for inspection. After inspection and correction of any fault found, the Contractor shall properly retape the joints.

Conductors shall be continuous without joints or splices in runs between outlet boxes. All splices shall be made at boxes only. Where stranded conductors are to be connected to any apparatus, bus work, switches or fuse blocks, they shall be connected by suitable mechanical solderless type lugs or spades. All lugs shall be permanently bolted in such position as to give maximum contact surface available. Where multiple circuits are run from same switch or panel, individual lugs for each conductor shall be used. Feeder taps in junction boxes or panel gutter shall be made with insulated cover panel gutter taps. Feeder conductors shall not be spliced, feeder conductors shall be continuous for the length of run.

Solid conductors, namely those sized #10 and #12 AWG copper, shall be spliced by using Ideal "wire-nuts", 3M Co. "Scotchlok", or T & B "Piggy" connectors for branch circuit splices in junction boxes and light fixtures, except recessed fixtures as noted above. "Sta-Kon" or other other permanent type crimp connectors shall not be used.

Stranded conductors, namely #8 AWG copper and larger, shall be spliced by approved mechanical connectors plus gum tape, plus friction or plastic tape. Solderless mechanical connectors, for splices and taps, provided with UL approved insulating covers, may be used instead of mechanical connectors plus tape.

DEVICE PLATES:

A device plate shall be provided for each outlet to suit the device installed. All plates shall be no. 302 stainless steel construction. All plates shall be "jumbo" size.

Device plates shall be of the one piece type, of suitable shape for the devices to be covered. The use of sectional device plates will not be permitted. Plates having a .375" bushed hole in the center shall be installed on all wall mounted outlets for telephones.

Devices and/or plates installed prior to painting shall be properly taped and shall be cleaned after painting, if necessary. Blank plates shall be installed on all unused outlets.

Plates shall be manufactured by Pass & Seymour, Bryant, or Hubbell. Provide sample of plates to Architect for approval.

RECEPTACLES:

Duplex convenience outlets for general use shall be rated 20 amperes, 125 volts, duplex, for standard parallel blade three-wire grounded type caps, Hubbell No. 5362-I (ivory), or approved equal. Color to be selected by Architect. Where outlets are installed vertically, ground plug position shall be on top and on right side where outlets are installed horizontally.

SPECIAL USE RECEPTACLES:

Provide special receptacles including receptacles with ground fault circuit interrupter protection, where needed, as required by equipment. Provide MOV-based transient voltage surge suppression devices (SS), where shown on plan. Tamper-resistant receptacles (TP) shall prevent insertion of objects other than a properly rated 2 or 3 wire plug using "floating" shutters. Equal devices by Hubbell, Pass & Seymour or Arrow-Hart are considered acceptable.

WALL SWITCHES:

Wall switches shall be installed as shown on the drawings and shall be connected to provide control of the outlets indicated. Switches shall be rated at 20 amperes for 120 volts or 277 volts lighting circuits. Hubbell No. 1221 (or 1221-1), for single pole; Hubbell Catalog No. 1223 (or 1223-1) for 3-way; Hubbell Catalog No. 1224 (or 1224-1) for 4-way. Weather-proof switches shall be Hubbell No. 1781 single pole or Hubbell No. 1783 3-way. Provide sample of switches to Engineer for approval. Color of switches to be selected by Architect.

Automatic light switches shall have passive infra-red occupancy switch with light sensor to prevent light from switching on when daylight is above pre-set level. Switch shall be UL listed, have adjustable time delay of 30 seconds to 30 minutes, auto/off control, and minimum coverage of 900 square feet, Automatic light switch shall be UNENCO model no. D-IS.

Provide special purpose switches where noted on the drawings, or elsewhere. Equal devices by Pass & Seymour or Arrow-Hart are considered acceptable.

For wall switches indicated as dimmers on LED lighting, coordinate the exact 0-10 volt dimmer that is compatible with LED driver at 277V for the specific fixtures provided. Install the correct size wall box to accommodate the specific dimmer to be installed.

END OF SECTION

LIGHTING FIXTURES:

Furnish and install all lighting fixtures as indicated on the drawings. Fixtures shall be complete with globe or reflector, and lamps, and wired ready for operation at the completion of installation. All fixtures shall have UL approval under their latest rulings indicating that fixture is approved for the intended usage. This Contractor shall provide proper fixture frames to suit type and dimensions of ceilings, confirming ceiling data with Contractor prior to ordering fixtures.

All fixtures shall be self-supporting, independent of the suspended ceiling. Fixtures shall be secured to the structure at a minimum of two points at opposing ends by wire equal to gauge of wire suspending the ceiling. Where fixture channels are joined to form a continuous length, provide one hanger at each end of the run and at each joint. Damaged fixtures shall be replaced at Contractor's expense.

ELECTRONIC BALLAST:

Fluorescent ballasts shall be high power factor electronic ballasts where indicated on schedule, designed for the rapid start operation of T8 lamps. Electronic ballast shall have a frequency of operation of 20 KHZ or greater, and operate without visible flicker. Ballast shall be UL listed Class P, CSA certified, sound rated "A", withstand line transients as defined in ANSE/IEEE C62-41 Category A, and meet FCC requirements of Rules and Regulations, Part 18 for non-consumer equipment. Electronic ballast casing temperature shall not exceed a 25°C rise over 40°C ambient temperature or not exceed 85°C total. Electronic ballasts shall be by Advance Transformer Co., model Mark V or approved equal by Motorola or Magnetek.

LAMPS:

All lamps shall be as manufactured by Sylvania, Phillips, or General Electric Co.. Incandescent lamps shall be inside frosted 130V extended service unless otherwise noted. The Contractor shall be responsible for replacing all lamps which burn out during warranty period starting after Owner accepts project.

Unless indicated otherwise on drawings, fluorescent lamps shall be rapid start energy saving 3100 K coloring rendering index 85 or better.

High pressure sodium lamps shall be GE "Lucalox" series or equal with median value of rated life no less than 24,000 hours.

EMERGENCY LIGHTING:

Furnish and install specified battery-powered emergency lighting units where indicated on the plans. Emergency lighting unit shall comply with the State of North Carolina Department of Insurance Document entitled "Requirements for Battery Powered Emergency Lighting Units" dated 20 March 1995 and all subsequent addenda. Fixture shall have test light and switch accessible and visible from floor.

EXIT LIGHTING:

Furnish and install LED emergency exit sign with battery backup, brown-out protection, pilot light, test switch, and regulated power supply, where indicated on the plans unless specified otherwise. Exit signs shall comply with the State of North Carolina Department of Insurance Document entitled "Requirements for Electrically Powered Exit Signs" dated 20 March 1995 and all subsequent addenda.

EXIT & EMERGENCY LIGHTING CONTROLS:

Contractor shall make provisions for Building Automation System (BAS) under Division 15 to exercise batteries on 21 to 28 day cycles. Coordinate with MC during rough-in as required with junction box for low voltage input to contactor.

LIGHTING CONTACTORS:

Each lighting contactor shall have heavy-duty ballast load rated contacts. Each contactor shall be normally closed contacts with mechanically held operators for open position, and silver cadmium oxide double break contacts. Contacts shall be field convertible with normally open and normally closed indicators. Each contactor shall be UL listed and CSA certified. All new lighting contactors for each new building shall be housed in a properly sized NEMA-1 enclosure with fully hinged and lockable door.

OUTDOOR LIGHTING CONTROLS:

For outdoor lighting applications, furnish and install contactors rated for load and photocells. Contractor shall make provisions for Building Automation System (BAS) or energy management control. Coordinate with MC during rough-in as required with junction box for low voltage input to contactor.

Photocells where indicated on drawing, shall be mounted in weather-proof enclosure under eastern facing eaves/overhangs with turn-on / off operations at 3-5 fc. Photocell shall be intermatic type K4221, for 120V and K4233 for 277V applications. Acceptable manufacturers are Tork, Intermatic, or Paragon. Photo cells shall not control luminaires directly all luminaries shall be controlled through a lighting contactor. Coordinate photocell specified with contactor coil rating.

END OF SECTION

SECURITY SYSTEM

Furnish and install all labor, materials and programming to provide complete and operational addition to the existing building security system.

The Scope of Work shall include:

- a. Access Control System provider shall provide all controllers, PIMs, etc. and all programming required to control the NDE and AD400 locksets as indicated on the architectural and electrical plans. Coordinate with G.C., section 08700 and door hardware provider.
- b. Access Control Contractor shall use "DMP or Bosch" Intrusion software to integrate with the AD400 integral door contact output.
- c. Access Control Contractor shall include (1) range testing device for each of the types of locksets (NDE & AD400) and verify all devices are within operational range of their controlling device. Make provision for supplying additional controllers as required to provide a fully operational system.
- d. Provide dual technology sensors with passive infrared motion and microwave sensing where indicated on the drawings, all corridors, connectors, and dining areas
- e. Receive coded signal from Fire Alarm panel (excluding "trouble status").
- f. Provide coded signal from Fire Alarm panel (excluding "trouble status") to indicate alarm status on GFAA.
- g. Communicator programmed to contact Owner's specified monitoring service.
- h. Vandal-proof controller enclosure.
- i. Security Cameras shall be Panasonic or equals approved by owner and engineer.
 - a. Exterior 4K – WV-SF781L
 - b. Exterior PTZ – WV-397A
 - c. Exterior Fixed – WV-SFV631L
 - d. Interior/Hallway – WV-SFV631L
- j. Connect to existing recorders. Include all mounting hardware and ASM software.

Security System shall be installed by a Open Options factory-authorized service organization with minimum five years of successful public school installation experience and licensed in N.C.

Security System controllers and programming shall be by Open Options to match existing or pre-approved equal that is compatible with existing system.

END OF SECTION

TESTS:

Test all lines to be concealed before burying or covering with new construction. Tests shall include proper operation of lights, receptacles, and equipment, continuity of conduit system, insulation leakage and impedance, elimination of motor single phasing or reverse rotation, and ground system resistance (see also Section 16400).

After the interior wiring system is completed and at such time as the Engineer or Owner's representative may direct, the Contractor shall conduct an operating test for approval. The tests shall be performed in the presence of the authorized representative of the Engineer and the installation shall be demonstrated to operate in accordance with the requirements of this specification. The Contractor shall furnish all instruments and personnel required for the test. The Contractor shall have sufficient tools and personnel available at the scheduled inspection to remove panel fronts, device plates, etc., as required for proper inspection of equipment, devices and wiring installation as may be required by the inspectors. Any material or workmanship which does not meet with approval of the engineer shall be promptly removed, repaired or replaced as directed, at no additional cost to the Owner.

ADJUSTMENTS:

Adjustments shall include load balancing of all electrical phases, at devices and panels. Balance all panelboards so that the maximum deviation of any one phase from the average of all the phases shall not exceed 10%. Re-type circuit directory as required after completion of adjustment.

CLEANING AND PAINTING:

Prior to final inspection, all equipment having factory finishes shall be thoroughly cleaned inside and outside. All damaged surfaces shall be replaced or refinished by Contractor, with paint same as original manufacturer. Engineer shall determine whether the damaged surface is to be replaced or painted.

RECORD DRAWINGS:

The Contractor shall maintain accurate records of all deviations in work as actually installed from work indicated on the drawings. On completion of the project, two (2) complete sets of marked-up prints shall be delivered to the Architect.

OPERATING AND MAINTENANCE INSTRUCTIONS:

Unless directed otherwise elsewhere in these specifications, the Contractor shall compile and bind three sets of all manufacturer's instructions and descriptive literature on all items of equipment furnished under this work. These instructions shall be delivered to the Engineer for approval prior to final inspection. Instructions shall include operating and testing procedures and a parts list of all equipment. The Contractor shall instruct the Owner's personnel in the proper operation of all systems and equipment. The front and side of the binder shall be titled "Electrical Operating and Maintenance Instructions", with name of the job and firm name of the Contractor.

WARRANTY:

The Contractor shall submit upon completion of the work, a warranty by his acceptance of the contract, that all work installed will be free from defects in workmanship and materials. If, during the period of one year, or as otherwise specified from date of Certificate of Completion and acceptance of work, any such defects in workmanship, materials, or performance appear, the Contractor shall, without cost to the Owner, remedy such defects within reasonable time to be specified in notice from the Architect. In default, the Owner may have such work done and charge cost to Contractor.

END OF SECTION

END OF SPECIFICATIONS